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Remedial Action Report for the Test Reactor Area Operable Unit 2-13

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Approved by

Julie Sherwood
WAG 2 Project Manager

7/24/00
Date

ABSTRACT

The purpose of the *Remedial Action Report for Test Reactor Area Operable Unit 2-13* is to describe the work performed, discuss modifications to the remedial action, and to document the final status of the project. The Operable Unit 2-13 Record of Decision requires remedial action to protect human health and the environment. An engineered cover was constructed at the Warm Waste Pond, and a soil cover of native materials was constructed at the Chemical Waste Pond and the Sewage Leach Pond. Radiological contaminated soil was removed from the Cold Waste Pond, and institutional controls were installed at the Sewage Leach Pond Berms/Soil Contamination Area, TRA-15, TRA-19 and the Brass Cap Area. Remedial actions are certified to be complete, operational, and functional.

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ACRONYMS

AOC	Area of Contamination
ARAR	applicable or relevant and appropriate requirement
ASTM	American Society of Testing Materials
BBWI	Bechtel BWXT, Idaho
BCA	Brass Cap Area
CC	Construction Coordinator
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Central Facilities Area
CFLUP	Comprehensive Facilities and Land Use Plan
CFR	Code of Federal Regulations
COC	contaminant of concern
CP	Chemical Waste Pond
CWP	Cold Waste Pond
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy Idaho Operations Office
ECA	Environmentally Controlled Area
EPA	Environmental Protection Agency
FFA/CO	Federal Facility Agreement and Consent Order
FRG	Final Remediation Goal
GFE	government furnished equipment
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HQ	hazard quotient

HWD	Hazardous Waste Determination
IDAPA	Idaho Administrative Procedures Act
IDHW	Idaho Department of Health and Welfare
IH	industrial hygiene(ist)
IHWMA	Idaho Hazardous Waste Management Act
INEEL	Idaho National Engineering and Environmental Laboratory
LDU	Land Disposal Unit
LDR	Land Disposal Restriction
LMITCO	Lockheed Martin Idaho Technologies Company
M&O	Maintenance and Operations
NESHAP	National Emission Standards for Hazardous Air Pollutants
O&M	operations and maintenance
OSHA	Occupational Safety and Health Administration
OU	operable unit
PM	project manager
R&A	relevant and appropriate
RA	remedial action
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RCT	radiological control technician
RD/RA	Remedial Design/Remedial Action
RI/FS	Remedial Investigation/Feasibility Study
RMA	Radiological Materials Area
RML	Radioactive Materials Laboratory
ROD	Record of Decision

RRWAC	Reusable Property, Recyclable Materials, and Waste Acceptance Criteria
RWMC	Radioactive Waste Management Complex
SAP	Sampling Analysis Plan
SCA	soil contamination area
SLP	Sewage Leach Pond
TAA	Temporary Accumulation Area
TAN	Test Area North
TCE	tricloroethylene
TCLP	Toxicity Characteristic Leaching Procedure
TRA	Test Reactor Area
UST	underground storage tank
WAG	Waste Area Group
WP	Work Plan
WWP	Warm Waste Pond

Remedial Action Report, for the Test Reactor Area Operable Unit 2-13

1. INTRODUCTION

1.1 Overview

In accordance with the Idaho National Engineering and Environmental Laboratory (INEEL) Federal Facility Agreement and Consent Order (FFA/CO), the U.S. Department of Energy (DOE) submits the following Remedial Action (RA) Report for the Test Reactor Area (TRA) Remedial Action Engineered Barrier Cover Project, designated as Waste Area Group (WAG) 2, Operable Unit (OU) 2-13 of the INEEL (Figure 1-1). The scope of this project is detailed in the *Remedial Design/Remedial Action Work Plan for Test Reactor Area Operable Unit 2-13*, (DOE-ID 1999a). The purpose of this report is to describe the work performed, discuss any modifications to the RA, and to document the final status of the project.

As outlined in the *Final Record of Decision Declaration for Test Reactor Area Operable Unit 2-13* (Record of Decision [ROD] [DOE-ID 1997a]), the Remedial Action Objectives (RAOs) for OU 2-13 are as follows:

- Inhibit direct exposure to radionuclide contaminants of concern (COCs) that would result in a total excess cancer risk greater than 1 in 10,000 to 1 in 1,000,000 to current and future workers and future residents
- Inhibit ingestion of radionuclide and nonradionuclide COCs by all affected exposure routes that would result in a total excess cancer risk greater than 1 in 10,000 to 1 in 1,000,000 or a hazard index greater than 1 to current and future workers and future residents
- Inhibit degradation of any low-level soil repository covers that would result in exposure to buried wastes or migration of contaminants, greater than 1 in 10,000 to 1 in 1,000,000 or a hazard index greater than 1 to current and future workers and future residents
- Inhibit adverse effects to resident populations of flora and fauna from soil, surface water, or air containing COCs
- Inhibit adverse effects to sites where COCs remain in place below ground surface that could result in exposure to COCs or migration of COCs to the surface.

The areas identified for remedial action and the selected remedies were outlined in the ROD (DOE-ID 1997a), see Table 1-1, and they were completed as follows:

- **Warm Waste Pond (WWP, TRA-03)**—Containment of the pond contents using an engineered cover consisting of several layers of geological materials to reduce potential exposures to the contaminants in the pond sediments by human and environmental receptors. This remedy also included the following institutional controls that are assumed to remain in effect for at least 100 years: long-term environmental monitoring, soil cover integrity monitoring and maintenance, surface water diversions, and access restrictions (e.g., permanent markers and signage).

Table 1-1. Selective remedial alternatives for sites of concern in OU 2-13.

	Selected Remedy
Warm Waste Pond (TRA-03) 1952 and 1957 Cells	Containment with an engineered cover and institutional controls
Warm Waste Pond 1964 Cell	Final basalt riprap or cobble gravel layer on existing native soil cover and institutional controls
Chemical Waste Pond (TRA-06)	Native soil cover and institutional controls
Cold Waste Pond (TRA-08)	Excavation and disposal
Sewage Leach Pond (TRA-13)	Containment with a native soil cover and institutional controls
Soil Surrounding Hot Waste Tanks at Building TRA-613 (TRA-15)	Limited Action for at least 100 years
Soil Surrounding Tanks 1 and 2 at Building TRA-630 (TRA-19)	Limited Action with implementation of a contingent excavation and disposal option
Brass Cap Area	Limited Action with implementation of a contingent excavation and disposal option
Sewage Leach Pond Berms and Soil Contamination Area	Limited Action for at least 100 years; berms will be placed in the floor of the Sewage Leach Pond

- **Chemical Waste Pond (CP, TRA-06)**—Containment with a native soil cover and institutional controls with possible excavation treatment and disposal after sampling. This remedy provided a sufficient thickness of soil to effectively reduce the potential for human and/or biological intrusion or excavation into the contamination.
- **Sewage Leach Pond (SLP, TRA-13)**—Containment using a native soil cover and institutional controls. This remedy provided a sufficient thickness of soil to effectively reduce the potential for intrusion or excavation into this contaminated area and provides shielding against exposure to radionuclide contamination.

- **Cold Waste Pond (CWP, TRA-08)**—Excavation followed by disposal at an appropriate facility (e.g., WWP 1957 Cell). Current administrative controls designed to protect worker health and safety will be maintained.

- **Soil Surrounding Hot Waste Tanks at Building TRA-613 (TRA-15)**—Limited Action, consisting of using existing administrative controls and implementation of long-term environmental monitoring for a period of at least 100 years to protect current and future occupational receptors. On the basis of predicted radioactive decay, no further action is expected at the end of 100 years. Five-year reviews will be conducted to ensure that the remedy remains protective for the entire period of administrative controls.

- **Soil Surrounding Tanks 1 and 2 at Building TRA-630 (TRA-19)**—Limited Action, with the contingency that, when controls established under the Limited Action are not maintained, then an excavation and disposal option will be implemented (to a maximum of 10 ft). This Limited Action alternative is preferred because the contamination associated with this site is located under the ground surface in and around active radioactive waste piping and tank systems and buildings where access is physically limited.

- **Brass Cap Area**—Limited Action with the contingency that, when controls established under the Limited Action are not maintained, then an excavation and disposal option will be implemented (to a maximum of 10 ft). This Limited Action alternative is preferred because the contamination associated with this site was located under the ground surface in and around active radioactive waste piping and tank systems and buildings where access was physically limited.

- **Sewage Leach Pond Berms and Soil Contamination Area**—Limited Action (existing administrative/institutional controls, including implementation of long-term environmental monitoring) for a period of at least 100 years to protect current and future occupational receptors. However, through radioactive decay, it is estimated that no further action will be needed at the end of the 100-year period. Consistent with the Sewage Leach Pond remedy, the windblown radionuclide-contaminated soil berms were placed in the bottom of the pond as part of the native soil cover. This remedy will continue to prevent or reduce potential occupational exposure to acceptable levels for the 100-year period that institutional controls are in place. The 5-year review process will be used to ensure that the remedy remains effective.

1.2 Background

Located 51 km (32 mi) west of Idaho Falls, Idaho, the INEEL occupies 2,305 km^2 (890 mi^2) of the northeastern portion of the Eastern Snake River Plain (see Figure 1-1), encompassing portions of five Idaho counties: (1) Butte, (2) Jefferson, (3) Bonneville, (4) Clark, and (5) Bingham. The TRA was established in the early 1950s in the southwestern portion of the INEEL. The TRA contains extensive facilities for studying the effects of radiation on materials, fuels, and equipment, including high neutron flux nuclear test reactors. Radioactive and Resource Conservation and Recovery Act (RCRA) hazardous wastes have been generated from scientific and engineering research projects conducted at TRA. Although extracted and treated, the wastes may still contain low-level radioactive and RCRA hazardous solutions that must be disposed. As originally designed and installed in the early 1950s, two separate liquid waste streams were generated and discharged at TRA: (1) sanitary sewage and (2) all other liquid waste streams. Over the years, waste minimization and additional segregation of waste streams has taken place.

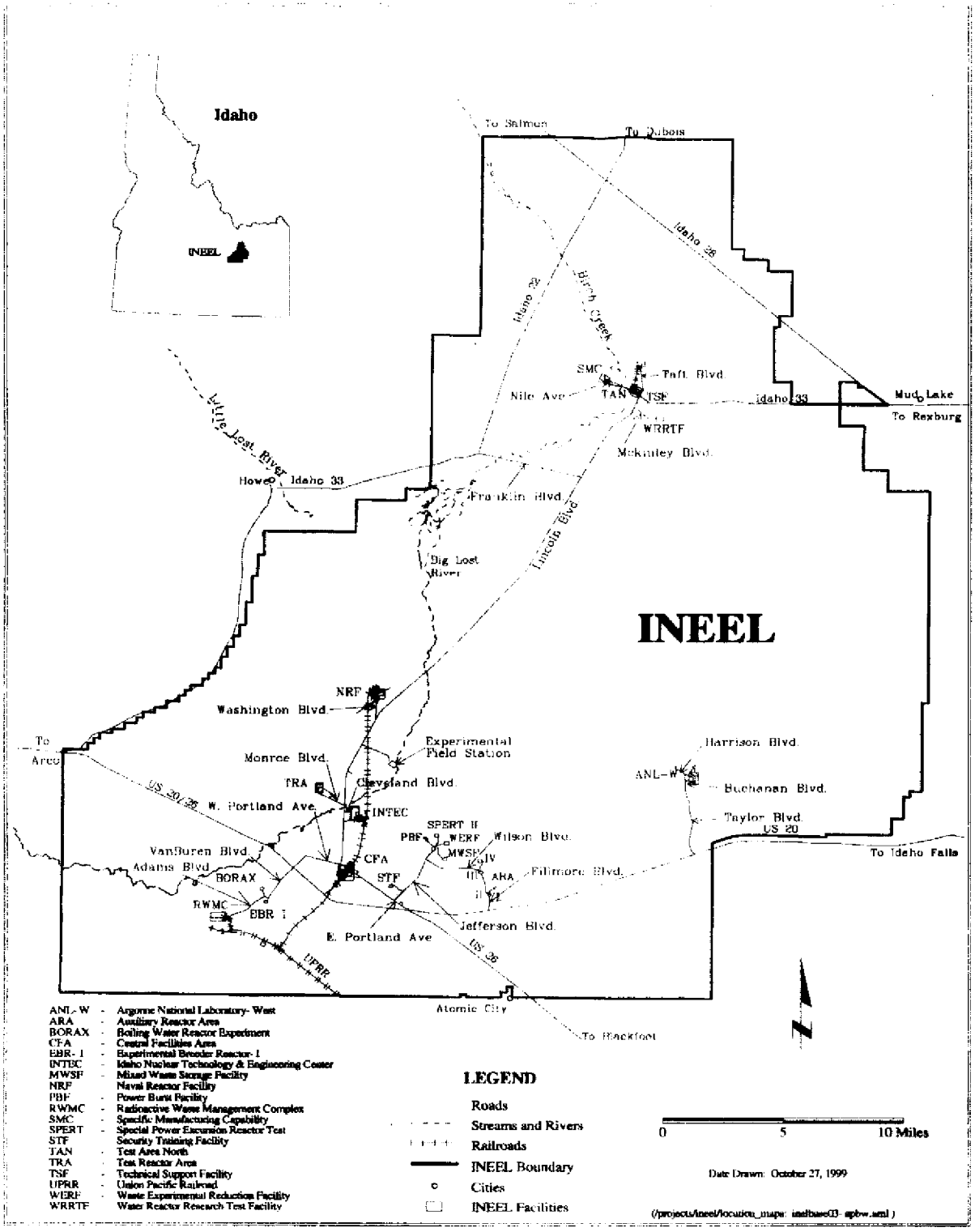


Figure 1-1. INEEL site map.

The following sections provide brief descriptions of the sites at the TRA that require remediation per the OU 2-13 ROD, based on post-ROD sampling (DOE-ID 1997a). The COCs for each of the sites and their associated final remediation goals (FRGs) are summarized in Table 1-2.

1.2.1 Warm Waste Pond

The WWP (see Figure 1-2) is located 27 m (90 ft) east of the TRA facilities along the security fence and consists of three cells (1952, 1957, and 1964) that received low-level radionuclide and RCRA-listed hazardous contaminated wastewater discharged from TRA reactor operations. It should be noted that RCRA-listed wastewater discharged to the WWP was just recently discovered and documented. The wastewater included cooling tower effluent, wastewater from hot cell drains, laboratory solutions, and floor drainage from the Advanced Test Reactor and other test reactors at the TRA.

In 1993, the WWP was taken out of service and replaced by a lined evaporation pond. To provide immediate risk reduction, an interim remedial action was conducted during 1993 by removing approximately 1.2 m (4 ft) of sediment from the sidewall and 0.9 m (3 ft) of sediment from the base of the Cell 1964 and placing the contaminated materials into the 1952 Cell. The Cell 1964 was backfilled with approximately 3 m (10 ft) of clean soil. Previously stockpiled materials from the cleanup of WWP windblown contamination were also placed in the 1952 Cell, which was then covered with a 0.3-m (1.0-ft) layer of clean fill and seeded. The 1957 Cell sidewall sediment was scraped into the base of the cell followed by disposal of materials from a demolished contaminated wooden structure. The 1957 Cell was covered with a 0.15-m (0.5-ft) layer of clean fill. In 1995 and 1996, contaminated soil from OU 10-06 removal actions was placed in the 1957 Cell and again, 0.15 m (0.5 ft) of clean fill was placed over the contaminated soil.

1.2.2 Chemical Waste Pond

The CP, located northeast of the TRA and adjacent to the security fence (Figure 1-2), was excavated and put into operation in 1962 as an unlined infiltration pond designed to receive waste water from a demineralization plant at the TRA. The pond received effluent containing mineral salts, primarily calcium and magnesium carbonate at average discharge of 57 L/min (15 gal/min). Until 1982, solid and liquid wastes were also disposed directly into the pond from a support structure constructed for waste disposal. This disposal included corrosives and other wastes. It is estimated that three or four 208-L (55-gal) drums were dumped into the CP from the support structure. Records show that acid from the vehicle storage facility at the Central Facilities Area (CFA) was drained directly into the CP in August 1992. Additionally, there were several releases of acid to the pond in the late 1980s. These were corrosive (D002) hazardous waste releases. It is not known if they contained any other RCRA-characteristic hazardous waste (metals). Because of this discharge, the CP retained its land disposal unit (LDU) status under the FFA/CO.

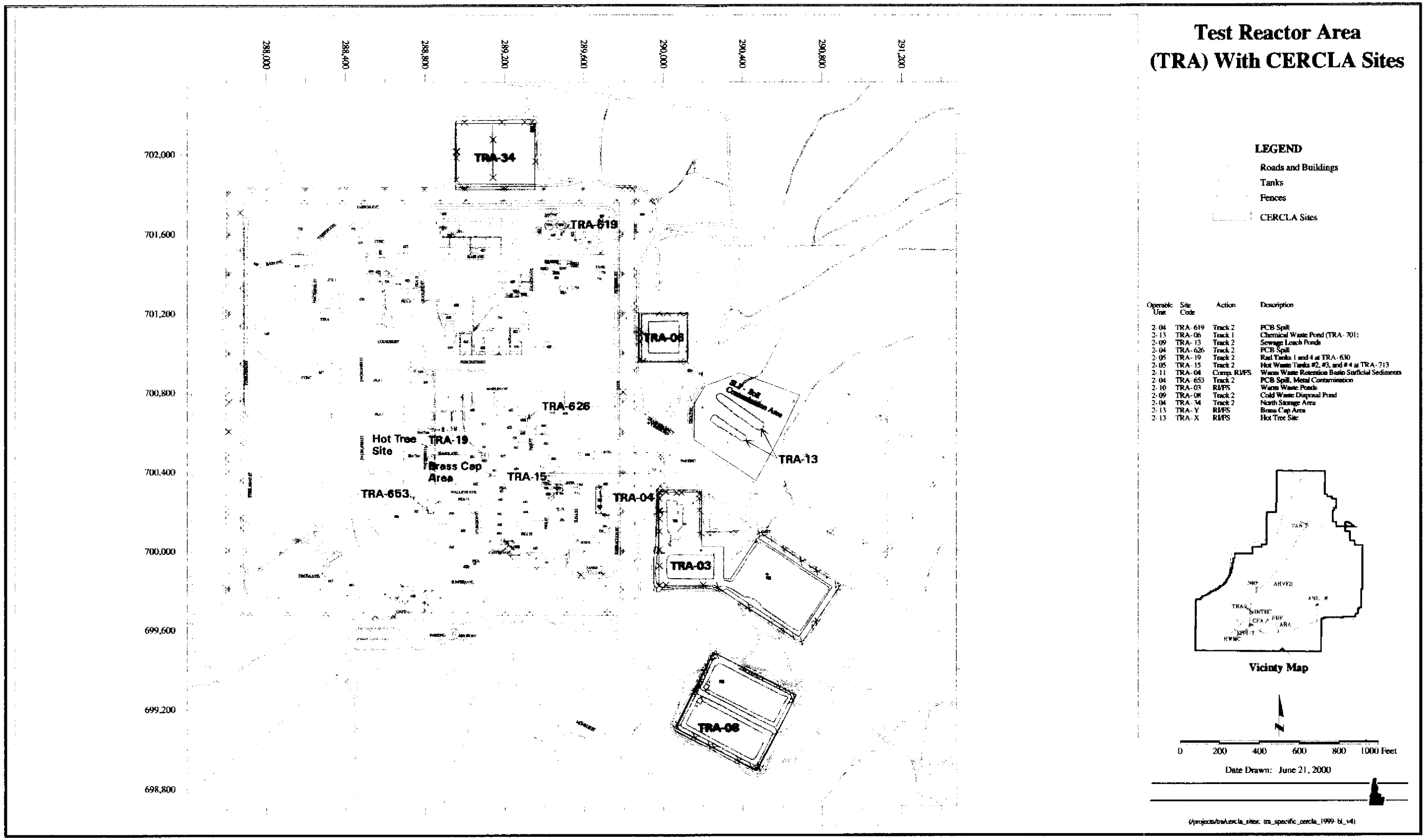


Figure 1-2. Map of TRA with retained CERCLA sites.

Table 1-2. Final remediation goals for OU 2-13 sites of concern.

Site	Contaminant of Concern	Final Remediation Goals (mg/kg for nonradionuclides pCi/gm for radionuclides)[a,b,c]
Warm Waste Pond (TRA-03)	Ag-108m	0.39
	Cs-137	7.78
	Eu-152	99.9
Chemical Waste Pond (TRA-06)	Ba	926
	Mn	146
	Hg	0.47
	Zn	43.3
Cold Waste Pond (TRA-08)	As	18.3
	Cs-137	11.7
Sewage Leach Pond (TRA-13)	Hg	0.94
	Zn	86.6
	Ag-108m	0.58
	Cs-137	11.7
Soil surrounding hot waste tanks at Building 613 (TRA-15)	Cs-137	23.3
Soil surrounding Tanks 1 and 2 at Building 630 (TRA-19)	Cs-137	23.3
Brass Cap Area	Cs-137	23.3
Sewage Leach Pond Berm and Soil Contamination Area	Cs-137	23.3

In 1990, sediments collected from the pond were analyzed for the metals known to be constituents of the effluent discharged to the pond as part of the demineralization process. These metals were silver, arsenic, barium, cadmium, chromium, copper, mercury, nickel, lead, selenium, and zinc. The analytical results indicate that only barium and mercury are present in the CP sediments above background levels.

A release of RCRA-characteristic hazardous waste occurred in May and June 1995, when approximately 1,068,788 L (287,100 gal) of liquid used to neutralize and flush out-of-service acid and caustic tanks was disposed to the pond. After disposal it was determined that the liquids contained 0.3 mg/L of mercury, which exceeds the 40 Code of Federal Regulations (CFR) 261.24 toxicity characteristic regulatory level of 0.2 mg/L. Sample data collected during the spring of 1998 verified that the CP sediments are not RCRA-characteristic hazardous waste (Appendix G of the RD/RA work plan).

1.2.3 Sewage Leach Pond

The SLP is located 45 m (150 ft) outside the TRA security fence, directly east of the central part of TRA (see Figure 1-2), and consists of two cells (1950 and 1965) where effluent was discharged from sanitary sewer drains throughout the TRA. The southern cell (1950) was constructed in 1950 and the northern cell (1965) in 1965. Process knowledge indicates that effluent was limited to domestic sewage (DOE-ID 1997b). However, low-level radionuclides were detected in the bottom of Cell 1950 and in a sludge pit located south of the Sewage Treatment Plant. The source of the contamination has been attributed to windblown soil contamination originating from the WWP.

The SLP was removed from service in 1995. Analytical data from the SLP demonstrates that RCRA-characteristic hazardous waste was not present. For information on the SLP berms and SCA see section 1.2.5.

1.2.4 Cold Waste Pond

The CWP is located approximately 137 m (450 ft) southeast of the TRA security fence (see Figure 1-2). The pond has been continually managed as a disposal site for nonradionuclide-contaminated wastewater since its construction in 1982. The pond consists of two cells (southern and northern) that were used for cold wastewater disposal from cooling tower blowdown, air conditioning units, secondary system drains, floor drains, and other nonradioactive drains throughout TRA. Historically, only one of the two cells was used at a time, and flow of wastewater was alternated from one cell to another on an annual basis. Radionuclides have been detected at concentrations slightly above INEEL background levels in several samples collected from the CWP. These low levels of radionuclides were found in samples collected from the pond berms and are thought to be the result of windblown soil contamination from the WWP rather than from effluent discharged to the CWP.

The two COCs identified for the CWP are Cs-137 and arsenic. The presence of Cs-137 is attributed to windblown soil contamination originating from the WWP, whereas, the presence of arsenic is due to historic disposal practices at the pond. Post-ROD sampling data (DOE-ID 1998a) confirmed that the pond sediments are below the final remediation goal (FRG) and the RCRA toxicity characteristic leaching procedure (TCLP) regulatory limit, therefore arsenic has been eliminated as a COC and the FRG for Cs-137 was increased to 23.3 pCi/g (as discussed in the final OU 2-13 ROD [DOE-ID 1997a]).

1.2.5 Sewage Leach Pond Berm and Soil Contamination Area

The SLP Berm and SCA is a fence-enclosed radiation control area surrounding the SLP (see Figure 1-2). The fenced area is approximately 145 × 147 m (475 × 480 ft). The source of the

surface soil contamination has been attributed to windblown soil contamination originating from the WWP. Analytical data from the SLP Berm and Soil Contamination Area demonstrates that no RCRA-characteristic hazardous waste was present.

During the interim action at the WWP in 1993, excavation of Cs-137 hot spots was performed at the SLP Berm. The contaminated soil was placed into the WWP Cell 1952.

1.2.6 Soil Surrounding Hot Waste Tanks at Building 613

The Soil Surrounding Hot Waste Tanks at Building 613 (TRA-15) is located south of TRA Building 613B (see Figure 1-2). This is the site of an underground tank leak at former Tank 1, which was one of four TRA underground storage tanks (USTs) used for radionuclide-contaminated waste. Site TRA-15 was defined as the soil in the vicinity of the remaining tanks (Tanks 2, 3, and 4). Former Tank 1 and Tank 2 were contained in the same concrete basin (TRA-713A), while an adjacent concrete basin (TRA-713B) contains Tanks 3 and 4. The floor of each concrete basin, located approximately 6.1 m (20 ft) below land surface, slopes to a french drain designed to dispose leakages into the subsurface. It was determined that leaks from Tanks 1 or 2 into the TRA-713A basin french drain contributed to contamination at and greater than 6 m (20 ft) below land surface. The environmental investigation detected elevated levels of radionuclides, notably Sr-90 and Cs-137, at depths between 7.6 and 9.1 m (25 and 30 ft) below land surface.

1.2.7 Soil Surrounding Tanks 1 and 2 at Building 630

The Soil Surrounding Tanks 1 and 2 at Building 630 (TRA-19) (see Figure 1-2) consists of subsurface soil contamination suspected of resulting from leaks from a radionuclide-contaminated waste drain line that originates at the Gamma Facility Building (TRA-641) or from possible releases from four underground catch tanks associated with the Materials Test Reactor (MTR). The original four catch tanks from the MTR were contained in a concrete vault. The tanks and vault were removed and replaced with new ones in 1985 and 1986. The original tanks were found to be intact upon removal and although the outside surface appeared to be degrading, the fiberglass liners had not been breached. Therefore, no releases from the tanks were suspected. Several spills inside the vault, however, had been reported as a result of pipe-cutting operations during tank removal, from reconnecting pipelines to the new tanks, and from a damaged waste drain line from Building TRA-641. It was reported that the spill contamination was cleaned up.

1.2.8 Brass Cap Area

The Brass Cap Area is located in the center of the TRA, near building TRA-630, and is southeast of site TRA-19 (Figure 1-2). The contamination at this site is attributed to leaking warm waste lines. Following discovery of the contamination, the leaking waste line was repaired and contaminated soil in the immediate proximity of the repaired waste line was removed. However, contaminated soil above FRGs still remains at the site. Following the soil removal and leak repair, the excavation was backfilled with clean soil and resurfaced with new concrete. A brass marker (hence, the name Brass Cap Area) was placed in the concrete to designate the area of subsurface contamination.

1.3 Organization of the Remedial Action Report

This report has two primary areas, (1) the body and (2) the appendices. Section 1 of the body is the background information and Section 2 summarizes the RA activities. Section 3 outlines the costs

incurred for the RA. Section 4 identifies modifications to the RA work plan. Section 5 discusses the waste streams generated on this project. Section 6 discusses the prefinal inspection checklist. Section 7 includes the summary and verification of the work performed, and Section 8 certifies that the finished product functions as designed.

The following is the list of the appendices located at the back of this document:

- Appendix A—Borrow Source Sampling
- Appendix B—Vendor Data Submittals
- Appendix C—As-Built Drawings and Final Grade Drawings
- Appendix D—Changes to Engineered Barrier Cover
- Appendix E—Photographs
- Appendix F—Prefinal Inspection Checklist
- Appendix G—INEEL Form 669, "Diesel Fuel Spill"
- Appendix H—North and South CWP Sampling Data
- Appendix I—Specification Section 2200 (Earth Work).

2. DISCUSSION OF THE REMEDIAL ACTIONS

2.1 Major Components of the Remedial Action

It needs to be noted that for access restrictions, fences around the CP, SLP, SLP-SCA, and the WWPs were not installed due to the existing INEEL main gate access controls for the general public. However, it was agreed to by the agencies that if such access restriction controls were ever discontinued, the agencies would revisit the need for fencing around these sites.

2.1.1 Warm Waste Pond

The selected remedy addresses the principal risks posed by the Warm Waste Pond by providing shielding from ionizing radiation, a cover to inhibit ecological and human intrusion, and a long-lasting cover to diminish the effects of wind and water erosion.

The major components of the RA for the WWP are:

- Containment by cover, with an engineered cover constructed primarily of native materials
- Consolidation of INEEL Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) generated contaminated materials of those already in the WWP for containment under the 1957 Cell engineered cover
- Consolidation of clean native soil from an appropriate borrow source located at the INEEL
- Contouring and grading of surrounding terrain to direct surface water runoff away from the covers
- Periodic aboveground radiological surveys following completion of the covers to assess the effectiveness of the remedial action
- Periodic inspection and maintenance following completion of the covers to ensure cover integrity and surface drainage away from the covers
- Maintenance of institutional controls, including signs, postings, and permanent markers
- Restrictions limiting land use for at least 100 years following completion of the covers
- Review of the remedy no less than every 5 years, until determined by the regulatory agencies to be unnecessary.

2.1.2 Chemical Waste Pond

The selected remedy addresses the principal risks posed by the Chemical Waste Pond by isolating the contaminants, providing institutional controls to inhibit human intrusion, and a long-lasting cover to inhibit the effects of wind and water erosion.

The major components of the RA for the CP are:

- Containment with a soil cover constructed primarily of native materials

- Consolidation of clean native soil from the berms surrounding the CP and from an appropriate borrow located at the INEEL
- Contouring and grading of surrounding terrain to direct surface runoff away from the cover
- Final cover layer materials of vegetated crested wheatgrass and a gravel mulch
- Periodic inspection and maintenance following completion of the cover to ensure integrity and surface drainage away from the cover
- Access restrictions consisting of posted signs and permanent markers
- Restrictions limiting land use for at least 100 years following completion of the cover
- Review of the remedy no less than every 5 years until, determined by the regulatory agencies to be unnecessary.

2.1.3 Sewage Leach Pond

The selected remedy addresses the principal risks posed by the Sewage Leach Pond by providing shielding from ionizing radiation, institutional controls to inhibit human intrusion, and a long-lasting cover to diminish the effects of wind and water erosion.

The major components of the RA for the SLP are:

- Containment by capping with a native soil cover constructed primarily of native materials
- Consolidation of soil from the berms surrounding the SLP and from an appropriate borrow source located at the INEEL
- Contouring and grading of surrounding terrain to direct surface water runoff away from the cover
- Final cover layer material vegetated with crested wheatgrass
- Periodic inspection and maintenance following completion of the cover to ensure integrity and surface drainage away from the cover
- Access restrictions consisting of posted signs and permanent markers
- Restrictions limiting land use for at least 100 years following completion of the cover
- Review of the remedy no less than every 5 years until, determined by the regulatory agencies to be unnecessary.

2.1.4 Cold Waste Pond

The selected remedy addresses the principal risks posed by the Cold Waste Pond by effectively removing the source of contamination and thus breaking the pathway by which a future receptor may be exposed.

The major components of the selected remedy for the CWP are:

- Sampling to identify hot spots
- Excavation of hot spots that were above 23.3 p Ci/g of Cs-137
- Disposal at an appropriate location (e.g., WWP 1957 Cell).

2.1.5 Sewage Leach Pond Berms and Soil Contaminated Area

The selected remedy addresses the principal risks posed by the Sewage Leach Pond Berms and Soil Contamination Area by effectively preventing access to the area so that exposure to contaminated media resulting in an unacceptable risk to human health and the environment would not be possible.

Major components of the selected remedy for Sewage Leach Pond Berms and Soil Contamination Area are:

- Placing contaminated soil from the berms in the bottom of the SLP cells
- Inspection of existing operation controls to assess the adequacy and need for additional institutional controls
- Access restrictions consisting of posted signs and permanent markers
- Restrictions limiting land use for at least 100 years
- Periodic inspection and maintenance to ensure integrity of institutional controls
- Review of the remedy no less than every 5 years, until determined by the agencies to be unnecessary.

2.1.6 Soil Surrounding Hot Waste Tanks at Building 613 (TRA-15)

The selected remedy addresses the principal risks posed by the Soil Surrounding Hot Waste Tanks at Building 613 by effectively preventing access to the area and exposure to contaminated media.

Major components of the selected remedy for TRA-15 are:

- Inspection of existing operational controls to assess the adequacy and need for additional institutional controls
- Access restrictions consisting of posted signs and permanent markers
- Restrictions limiting land use for at least 100 years
- Periodic inspection and maintenance to ensure integrity of institutional controls
- Review of the remedy no less than every 5 years, until determined by the regulatory agencies to be unnecessary.

2.1.7 Soil Surrounding Tanks 1 and 2 at Building 630 (TRA-19)

The selected remedy addresses the principal risks posed by the Soil Surrounding Tanks 1 and 2 at Building 630 (TRA-19) by effectively preventing access to the area so that exposure to contaminated media resulting in an unacceptable risk to human health and the environment would not be possible. In addition, if controls established under the Limited Action were not maintained, then excavation and removal of contaminated media would effectively remove the source of contamination and thus break the pathway by which future receptors may be exposed.

Major components of the selected remedy for TRA-19 are:

- Inspection of existing operational controls to assess the adequacy and need for additional institutional controls
- Access restrictions consisting of posted signs and permanent markers
- Restrictions limiting land use for at least 100 years
- Periodic inspection and maintenance to ensure integrity of institutional controls
- Review of the remedy no less than every 5 years, until determined by the agencies to be unnecessary
- Once controls established under the limited action are not maintained (no longer than 100 years) or do not continue to be protective, then excavation and disposal of contaminated soil will be implemented.

2.1.8 Brass Cap Area

The selected remedy addresses the principal risks posed by the Brass Cap Area by effectively preventing access to the area so that exposure to contaminated media resulting in an unacceptable risk to human health and the environment would not be possible. In addition, if controls established under the Limited Action were not maintained, then excavation and removal of contaminated media would effectively remove the source of contamination and thus break the pathway by which future receptors may be exposed.

Major components of the selected remedy for the Brass Cap Area are:

- Inspection of existing operational controls to assess the adequacy and need for additional institutional controls
- Access restrictions consisting of posted signs and permanent markers. Restrictions limiting land use for at least 100 years
- Periodic inspection and maintenance to ensure integrity of institutional controls
- Review of the remedy no less than every 5 years, until determined by the agencies to be unnecessary

- Once controls established under the limited action are not maintained (no longer than 100 years) or do not continue to be protective, then excavation and disposal of contaminated soil will be implemented.

2.2 Site Preparation and Mobilization

The following subsections discuss the efforts performed prior to the start of the RA, which include:

- Providing required training of personnel
- Preparing the work area
- Reviewing regulatory requirements to ensure compliance with all codes as specified in the contract documents
- Complying with INEEL requirements.

2.2.1 Personnel Training Requirements and Support Facility Setup

Prior to the start of fieldwork, all contractor and subcontractor personnel assigned to the project were required to have a baseline medical examination and the following training:

- INEEL site-specific orientation and security briefing
- Radiation Worker II training
- Hazardous Waste Operations and Emergency Response (HAZWOPER) 40-hour training
- Work site orientation
- Health and Safety Plan (HASP) training
- Training to applicable plans and procedures as required by the HASP
- Hazardous Waste Operation 24-hour "on-the-job" training
- 8-hour HAZWOPER supervisory training for Job Site Supervisor.

Certifications of training and training updates were maintained in the project files. The subcontractor was required to update and submit a three-week rolling schedule to the construction coordinator (CC) on a regular basis. After the subcontractor personnel completed the training, they set up the construction boundaries on the SLP. Once the subcontractor delivered the necessary equipment needed to perform the work, the work area was prepared.

2.2.2 Work Area Preparation

The subcontractor was required to submit a Job Safety Analysis Plan and work plan prior to the start of fieldwork. The subcontractor delivered the jobsite trailer and heavy equipment onsite on March 8, 1999. The heavy equipment was inspected and inspection documented by the CC prior to use. Once training records were verified, a notice to proceed was issued to the subcontractor that allowed them to contractually start work in the field. After a prejob briefing was held, the subcontractor began setting up boundaries around the work site and began filling the different ponds.

2.2.3 Regulatory Compliance

The RA was required to conform to the following applicable or relevant and appropriate requirements (ARARs) as outlined in Table 2-1.

2.2.4 INEEL Work Permit Requirements

In order to comply with INEEL procedures, the subcontractor was required to have the following permits in addition to a HASP:

- Prejob Checklist
- Standard 101 work package
- Radiological work permit
- Subsurface investigation request
- Plan of the day meetings each day
- Construction Work Authorization
- Hazards review for construction projects
- Equipment inspections
- Postjob Checklist.

2.3 Remedial Action

The RA consists of installing native soil covers and engineered barrier covers, as well as excavation of radiologically contaminated soil and installing institutional controls. It needs to be noted that for access restrictions, fences around the CP, SLP, SLP-SCA, and the WWPs were not installed due to the existing INEEL main gate access controls for the general public. However, it was agreed to by the agencies that if such access restriction controls were ever discontinued, the agencies would revisit the need for fencing around these sites. Figure 1-2 shows the location of the TRA worksite.

Different types of soil were used to fill the CWP, CP, SLP, and WWP. The following is a list of soil types and what the types consist of.

- Type "A"—Silt
- Type "B"—Gravel and coarse sand
- Type "C1"—Gravel and coarse sand from the Sewage Leach Pond Berms
- Type "C2"—Gravel and coarse sand from the Sewage Leach Pond Berms with radiological contamination.

Table 2-1. Compliance with ARARs.

ARAR/TBC	Substantive Requirement(s)	A/R&A[a]	ARAR Implementation in RA
Warm Waste Pond—Containment with an Engineered Barrier			
40 CFR 61.92, .93, and 94(a) NESHAPS for Emissions of Radionuclides Other than Radon from DOE Facilities	Emissions of radionuclides to the ambient air from DOE facilities shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of ≥10 mrem/yr. Radionuclide emissions shall be determined and effective dose equivalent values to members of the public calculated. The highest calculated effective dose equivalent to any member of the public must be reported annually.	A	The WWP had a layer of clean fill over all cells at the start of RA. No contaminants were exposed during the remedial action. Air modeling/emissions calculations for the placement of CWP and SLP contaminated soil into the WWP Cell 1952 were presented in Appendix I of the RD/RA Work Plan. These calculated emissions were included in the INEEL's annual National Emissions Standards for Hazardous Air Pollutants (NESHAPs) report, and caused no unaccepted dose to the public.
IDAPA 16.01.01.585 and .586 Toxic Substances	Screening emission levels and acceptable ambient air concentrations for carcinogens and noncarcinogens shall not be exceeded.	A	The WWP has a layer of clean fill over all cells. No contaminants were exposed during the remedial action. Therefore, no screening calculations were required.
IDAPA 16.01.05.008 [40 CFR 264.309(a) and (b)] Surveying and Recordkeeping	The owner or operator of a landfill must maintain the following items in the operation record required under 40 CFR 264.73: • On a map, the exact location and dimensions, including depth, of each cell with respect to permanently surveyed benchmarks. The contents of each cell and the approximate locations of each hazardous waste type within each cell.	R&A	Final as-built drawings identifying pond dimensions (including depth), survey coordinates, and location of hazardous waste sediments remaining in place were prepared at the completion of the remedial action and are included in Appendix C of this document. The requirements of 40 CFR 264.73(b)(1), (2), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), and (16) do not apply to this CERCLA remedial action. The requirements for contingency planning in 40 CFR 264.73(b)(4), which references to 40 CFR 264.56(j), were met by the implementation of the *INEL Emergency Plan/RCRA Contingency Plan* (INEEL 1998c) and the CFA specific addendum (INEEL 1998d).

Table 2-1. (continued).

ARAR/TBC	Substantive Requirement(s)	A/R&A[a]	ARAR Implementation in RA
IDAPA 16.01.05.008 [40 CFR 264.310(a)(1), (2), (3), (4), and (5)] Closure and Postclosure Care	The cover design must: 1. Provide long-term minimization of migration of liquids through the closed landfill 2. Function with minimum maintenance 3. Promote drainage and minimize erosion or abrasion of the cover 4. Accommodate settling and subsidence so that the cover's integrity is maintained 5. Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.	R&A	1. Cells 1952 and 1957 had an engineered cover installed over them that resulted in minimization of liquid migration through the cells. For Cells 1952 and 1957, GWSCREEN modeling results demonstrated that contaminant migration to the aquifer does not pose unacceptable risks (Appendix K of the RD/RA work plan DOE-ID-10643). Modeling of Cell 1964 (Appendix K of the RD/RA work plan DOE-ID-10643) also demonstrated that contamination migration to the aquifer does not pose an unacceptable risk. The discharge pipes to the WWP were cut and grouted in place to minimize potential for migration of liquid into the WWP. 2. The covers were designed to require minimal maintenance. Cells 1952 and 1957 have a gravel/cobble/gravel layer with a riprap barrier. Cell 1964 was vegetated and now has a riprap barrier. All covers are constructed of natural material. 3. Covers were designed to have uniform and continuous slopes with drainage basins to facilitate drainage and minimize erosion. Gravel/cobble/gravel layers on Cells 1952 and 1957 and vegetation on Cell 1964 minimize erosion and abrasion of the cover. The cover design and sloping minimize runoff velocity and erosion. Erosion calculations are in Appendix C of the RD/RA work plan DOE-ID-10643. 4. The operation and maintenance (O&M) Plan (DOE-ID 1999b) identifies inspection and maintenance requirements for maintaining settling, subsidence, and erosion control systems. These requirements will be implemented. 5. Based on permeability calculations conducted for the WWP the permeability of the covers and/or fill material were less than that of the natural subsoils. Data and permeability calculations are presented in Appendix J of DOE-ID-10643.

Table 2-1. (continued).

ARAR/TBC	Substantive Requirement(s)	A/R&A[a]	ARAR Implementation in RA
IDAPA 16.01.05.008 [40 CFR 264.310(b)(1), (5), and (6)] Closure and Postclosure Care	After final closure, the owner or operator must: 1. Maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events 2. Prevent runon and runoff from eroding or otherwise damaging the final cover 3. Protect and maintain surveyed benchmarks.	R&A	The requirements of 40 CFR 264.117 through 264.120 referenced in 264.310(b) do not apply to this CERCLA remedial action. 1. The O&M Plan (DOE-ID 1999b) identifies inspection and maintenance to address settling, subsidence, or erosion of the covers. These requirements will be implemented. 2. Sloping, vegetative layer on Cell 1964, gravel/cobble/gravel layers (Cells 1952 and 1957) and riprap were designed to prevent runon and runoff from eroding or damaging the cover. 3. Survey benchmarks were maintained or a new benchmark with tie-in data was established.
Chemical Waste Pond—Containment With Native Soil Barrier[b]			
40 CFR 61.92, .93, and 94(a) NESHAPS for Emissions of Radionuclides Other than Radon from DOE Facilities	Emissions of radionuclides to the ambient air from DOE facilities shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of ≥10 mrem/yr. Radionuclide emissions shall be determined and effective dose equivalent values to members of the public calculated. The highest calculated effective dose equivalent to any member of the public must be reported annually.	A	No radionuclides were detected above background concentrations. Therefore, no air modeling/emissions were required.
IDAPA 16.01.01.585 and .586 Toxic Substances	Screening emission levels and acceptable ambient air concentrations for carcinogens and noncarcinogens shall not be exceeded.	A	The remedial action placed clean fill in the pond and eliminated the air pathway. Air modeling/emissions calculations for this project are presented in Appendix I of RD/RA work plan DOE-ID-10643 and are below screening emission levels.

Table 2-1. (continued).

ARAR/TBC	Substantive Requirement(s)	A/R&A[a]	ARAR Implementation in RA
IDAPA 16.01.05.008 [40 CFR 264.309(a) and (b)] Surveying and Recordkeeping	The owner or operator of a landfill must maintain the following items in the operation record required under 40 CFR 264.73: • On a map, the exact location and dimensions, including depth, of each cell with respect to permanently surveyed benchmarks • The contents of each cell and the approximate locations of each hazardous waste type within each cell.	R&A	Final as-built drawings, identifying pond dimensions (including depth) and survey coordinates are in Appendix C of this document. The requirements of 40 CFR 264.73(b)(1), (2), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), and (16) do not apply to this CERCLA remedial action. The requirements for contingency planning in 40 CFR 264.73(b)(4), which references to 40 CFR 264.56(j), were met by the implementation of the *INEL Emergency Plan/RCRA Contingency Plan* (INEEL 1998c) and the CFA specific addendum (INEEL 1998d).
IDAPA 16.01.05.008 [40 CFR 264.310(a)(1), (2), (3), (4), and (5)] Closure and Postclosure Care	The cover design must: 1. Provide long-term minimization of migration of liquids through the closed landfill 2. Function with minimum maintenance 3. Promote drainage and minimize erosion or abrasion of the cover 4. Accommodate settling and subsidence so that the cover's integrity is maintained 5. Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.	R&A	Based on Post-ROD sampling (DOE-ID 1998a) it was determined that there is no RCRA-characteristic hazardous waste. However, for this site the following was provided: 1. The CP has a native soil cover. GWSCREEN modeling results demonstrate that contaminant migration to the aquifer does not pose unacceptable risks (Appendix K of DOE-ID-10643). The discharge pipe to the CP was grouted in place to minimize potential for migration of liquid into the CP. 2. The cover was designed to require minimal maintenance. The cover was constructed of natural material with a vegetative layer. 3. The natural cover was designed to have uniform and continuous slopes with drainage basins to facilitate drainage and minimize erosion. Vegetation minimizes erosion and abrasion of the cover. The cover design and sloping minimize runoff velocity and erosion. Erosion calculations are in Appendix C of DOE-ID-10643. 4. The O&M Plan (DOE-ID 1999b) identifies inspection and maintenance requirements for maintaining settling, subsidence, and erosion control systems. These requirements will be implemented. 5. Based on geotechnical testing of fill material and the natural subsoils in the CP, permeability of the cover/fill material was less than that of the natural subsoils. Data and permeability calculations are presented in Appendix J of DOE-ID-10643.

Table 2-1. (continued).

ARAR/TBC	Substantive Requirement(s)	A/R&A[a]	ARAR Implementation in RA
IDAPA 16.01.05.008 [40 CFR 264.310(b)(1), (5), and (6)] Closure and Postclosure Care	After final closure, the owner or operator must: 1. Maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events 2. Prevent runon and runoff from eroding or otherwise damaging the final cover 3. Protect and maintain surveyed benchmarks.	R&A	The requirements of 40 CFR 264.117 through 264.120 referenced in 264.310(b) do not apply to this CERCLA remedial action. 1. The O&M Plan (DOE-ID 1999b) identifies inspection and maintenance to address settling, subsidence, or erosion of the covers. These requirements will be implemented. 2. Sloping and a vegetative layer were designed to prevent runon and runoff from eroding or damaging the native soil cover. 3. Survey benchmarks were maintained, or a new benchmark with tie-in data was established as necessary.
Cold Waste Pond—Excavate and Dispose			
40 CFR 61.92, .93, and 94(a) NESHAPS for Emissions of Radionuclides Other than Radon from DOE Facilities	Emissions of radionuclides to the ambient air from DOE facilities shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of ≥10 mrem/yr. Radionuclide emissions shall be determined and effective dose equivalents values to members of the public calculated. The highest calculated effective dose equivalent to any member of the public must be reported annually.	A	Air modeling/emissions calculations for this project are presented in Appendix I of DOE-ID-10643. These calculated emissions were included in the INEEL's annual NESHAPs report, and caused no unacceptable effective dose equivalent to members of the public from the INEEL.
IDAPA 16.01.01.585 and .586 Toxic Substances	Screening emission levels and acceptable ambient air concentrations for carcinogens and noncarcinogens shall not be exceeded.	A	Air modeling/emissions calculations for this project were presented in Appendix I of DOE-ID-10643 and are below screening levels.

Table 2-1. (continued).

ARAR/TBC	Substantive Requirement(s)	A/R&A[a]	ARAR Implementation in RA
IDAPA 16.01.05.006 (40 CFR 262.11) Hazardous Waste Determination	A generator of solid waste (40 CFR 261.2) must determine if that waste is a hazardous waste: 1. Determine if the waste is excluded under 40 CFR 261.4 2. Determine if the waste is listed under 40 CFR 261 Subpart D 3. Determine whether the waste is identified in 40 CFR 261 Subpart C. If the waste is determined to be hazardous, the generator must refer to 40 CFR 261, 264, 265, 266, 268, and 273.	A	Waste excavated from the CWP was managed in accordance with the outcome of the Hazardous Waste Determination (HWD). Based on post-ROD sampling data (DOE-ID 1998a) the waste was determined to be nonhazardous. Waste removed from the CWP was placed in the WWP. The generic references to IDAPA 16.01.05.005 through .011 and 40 CFR 261, 264, 265, 266, 268, and 273 are not applicable unless specifically called out in this table for this site.
Sewage Leach Pond—Native-Soil Cover and Sewage Leach Pond Berm and Soil Contamination Area—Institutional Control/Use as Backfill in the Sewage Leach Pond			
40 CFR 61.92, .93, and 94(a) NESHAPS for Emissions of Radionuclides Other than Radon from DOE Facilities	Emissions of radionuclides to the ambient air from DOE facilities shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of ≥10 mrem/yr. Radionuclide emissions shall be determined and effective dose equivalent values to members of the public calculated. The highest calculated effective dose equivalent to any member of the public must be reported annually.	A	Air modeling/emissions calculations for this project were presented in Appendix I of DOE-ID-10643. These calculated emissions were included in the INEEL's annual NESHAPs report, and caused no unacceptable effective dose equivalent to members of the public from the INEEL.
IDAPA 16.01.01.585 and .586 Toxic Substances	Screening emission levels and acceptable ambient air concentrations for carcinogens and noncarcinogens shall not be exceeded.	A	For the SLP and SLP Berm and SCA, no screening emissions calculations were required.

Table 2-1. (continued).

ARAR/TBC	Substantive Requirement(s)	A/R&A[a]	ARAR Implementation in RA
Soil Surrounding Hot Waste Tanks at Building 613 (TRA-15)—Institutional Control			
40 CFR 61.92, .93, and 94(a) NESHAPS for Emissions of Radionuclides Other than Radon from DOE Facilities	Emissions of radionuclides to the ambient air from DOE facilities shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of ≥10 mrem/yr. Radionuclide emissions shall be determined and effective dose equivalents values to members of the public calculated. The highest calculated effective dose equivalent to any member of the public must be reported annually.	A	TRA-15 is currently covered by soil and provides no radionuclide emission source to the ambient air. When remedial action is taken at this site, air modeling/emissions calculations will be conducted similar to those specified to the other sites in this table (WWP, CP, CWP, and SLP). Reporting is through the INEEL annual emissions report for emissions from the INEEL as a whole.
IDAPA 16.01.01.585 and .586 Toxic Substances	Screening emission levels and acceptable ambient air concentrations for carcinogens and noncarcinogens shall not be exceeded.	A	No action, beyond ensuring continued institutional controls, is currently planned at TRA-15. When remedial action is required, screening emission levels will be calculated at the time of the excavation.
Soil Surrounding Tanks 1 and 2 at Building 630 (TRA-19)—Institutional Control with Excavate and Disposal Contingency			
40 CFR 61.92, .93, and 94(a) NESHAPS for Emissions of Radionuclides Other than Radon from DOE Facilities	Emissions of radionuclides to the ambient air from DOE facilities shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of ≥10 mrem/yr. Radionuclide emissions shall be determined and effective dose equivalent values to members of the public calculated. The highest calculated effective dose equivalent to any member of the public must be reported annually.	A	TRA-19 is currently covered by soil and provides no radionuclide emission source to the ambient air. When remedial action is taken at this site, air modeling/emissions calculations will be conducted similar to those specified to the other sites in this table (WWP, CP, CWP, and SLP). Reporting is through the INEEL annual emissions report for emissions from the INEEL as a whole.
IDAPA 16.01.01.585 and .586 Toxic Substances	Screening emission levels and acceptable ambient air concentrations for carcinogens and noncarcinogens shall not be exceeded.	A	No action, beyond ensuring continued institutional controls, is currently planned at TRA-19. When remedial action is taken, screening emission levels will be calculated at the time of the excavation.

Table 2-1. (continued).

ARAR/TBC	Substantive Requirement(s)	A/R&A[a]	ARAR Implementation in RA
IDAPA 16.01.05.006 (40 CFR 262.11) Hazardous Waste Determination	A generator of solid waste (40 CFR 261.2) must determine if that waste is a hazardous waste: 1. Determine if the waste is excluded under 40 CFR 261.4 2. Determine if the waste is listed under 40 CFR 261 Subpart D 3. Determine whether the waste is identified in 40 CFR 261 Subpart C. If the waste is determined to be hazardous, the generator must refer to 40 CFR 261, 264, 265, 266, 268, and 273.	A	No action, beyond ensuring continued institutional controls, is currently planned at TRA-19. When remedial action is required, a HWD will be performed at that time. There is currently insufficient data to perform a HWD. A determination will be made whether this site is contaminated with RCRA-listed hazardous waste before excavation. A sampling and analysis plan for this site will be prepared to address data collection for a no-longer contained-in determination as necessary. A HWD will be completed after receipt of analytical data. The generic references to IDAPA 16.01.05.005 through .011 and 40 CFR 261, 264, 265, 266, 268, and 273 are not applicable unless specifically called out in this table.
Brass Cap Area—Institutional Control with Excavate and Disposal Contingency			
40 CFR 61.92, .93, and 94(a) NESHAPS for Emissions of Radionuclides Other than Radon from DOE Facilities	Emissions of radionuclides to the ambient air from DOE facilities shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of ≥10 mrem/yr. Radionuclide emissions shall be determined and effective dose equivalent values to members of the public calculated. The highest calculated effective dose equivalent to any member of the public must be reported annually.	A	The Brass Cap Area is currently covered by soil and provides no radionuclide emission source to the ambient air. When remedial action is taken at this site, air modeling/emissions calculations will be conducted similar to those specified to the other sites in this table (WWP, CP, CWP, and SLP). Reporting is through the INEEL annual emissions report for emissions from the INEEL as a whole.
IDAPA 16.01.01.585 and .586 Toxic Substances	Screening emission levels and acceptable ambient air concentrations for carcinogens and noncarcinogens shall not be exceeded.	A	No action is currently planned at the Brass Cap Area. When remedial action is required, screening emission levels will be calculated at the time of the excavation.

Table 2-1. (continued).

ARAR/TBC	Substantive Requirement(s)	A/R&A[a]	ARAR Implementation in RA
IDAPA 16.01.05.006 [40 CFR 262.11] Hazardous Waste Determination	A generator of solid waste (40 CFR 261.2) must determine if that waste is a hazardous waste: 1. Determine if the waste is excluded under 40 CFR 261.4 2. Determine if the waste is listed under 40 CFR 261 Subpart D 3. Determine whether the waste is identified in 40 CFR 261 Subpart C. If the waste is determined to be hazardous, the generator must refer to 40 CFR 261, 264, 265, 266, 268, and 273.	A	No action, beyond ensuring continued institutional controls, is currently planned at the Brass Cap Area. When remedial action is required, a HWD will be performed at that time. There is currently insufficient data to perform a HWD. A determination will be made whether this site is contaminated with RCRA-listed hazardous waste before excavation. A sampling and analysis plan for this site will be prepared to address data collection for a no-longer contained-in determination as necessary. A HWD will be completed after receipt of analytical data. The generic references to IDAPA 16.01.05.005 through .011 and 40 CFR 261, 264, 265, 266, 268, and 273 are not applicable unless specifically called out in this table.
Additional ARARs for all Actions at all Sites			
IDAPA 16.01.05.006 (40 CFR 262.11) Hazardous Waste Determination	A generator of solid waste (40 CFR 261.2) must determine if that waste is a hazardous waste: 1. Determine if the waste is excluded under 40 CFR 261.4 2. Determine if the waste is listed under 40 CFR 261 Subpart D 3. Determine whether the waste is identified in 40 CFR 261 Subpart C. If the waste is determined to be hazardous, the generator must refer to 40 CFR 261, 264, 265, 266, 268, and 273.	A	Hazardous waste determinations were prepared for all waste streams generated before they were removed from the jobsite. The determinations were based on process/historical knowledge and analytical data. The generic references to IDAPA 16.01.05.005 through .011 and 40 CFR 261, 264, 265, 266, 268, and 273 are not applicable unless specifically called out in this table.

Table 2-1. (continued).

ARAR/TBC	Substantive Requirement(s)	A/R&A[a]	ARAR Implementation in RA
IDAPA 16.01.05.011 (40 CFR 268.7) Waste Analysis and Record Keeping Land Disposal Restrictions	Requirements for waste analysis and record keeping for hazardous waste. Notifications required in this section are not substantive requirements and do not apply to this CERCLA remedial action.	A	No RCRA-listed or characteristic waste was encountered during the remedial action at the WWP, CP, CWP, SLP, or SLP Berm and SCA. The WWP contains RCRA-listed waste; however, clean fill material was previously placed over the WWP cells. Cutting and grouting the WWP influent line was performed in a manner such that no internal surfaces of the piping were in contact with equipment. The activities during the remedial action did not result in any generation of or contact with RCRA-listed waste. The rest of these sites do not contain RCRA-listed or characteristic hazardous waste. The Test Area North (TAN) soils contaminated with RCRA-F001 (trichloroethylene [TCE]) listed waste were consolidated into the WWP Cell 1957 as part of the OU 10-06 CERCLA remedial action. The TCE concentration in the soils was less than the land disposal restrictions (LDR) requirement (6.0 mg/kg) at the time of disposal. There are no further LDR requirements for this soil. Data are presented in Appendix M of the RD/RA work plan. There are RCRA-listed waste codes (Appendix H of the RD/RA work plan) associated with the WWP sediments. These sediments remain within the area of contamination and no LDR requirements apply.
IDAPA 16.01.05.011 (40 CFR 268.9) Special Rules Regarding Wastes That Exhibit a Characteristic Land Disposal Restrictions	Requirements for determination of hazardous waste codes and treatment standards. Notifications required in this section are not substantive requirements and do not apply to this CERCLA remedial action.	A	No RCRA-listed or characteristic waste was encountered during the remedial action at the WWP, CP, CWP, SLP, or SLP Berm and SCA. The WWP contains RCRA-listed waste; however, clean fill material was previously placed over the WWP cells. Cutting and grouting the WWP influent lines was performed in a manner such that no internal surfaces of the piping were in contact with equipment. The activities during this remedial action did not result in any generation of or contact with RCRA-listed waste. The rest of these sites do not contain RCRA-listed or characteristic hazardous waste. The TAN soils contaminated with RCRA-F001 (TCE) listed waste were consolidated into the WWP Cell 1957 as part of the OU 10-06 CERCLA remedial action. The TCE concentration in the soils was less than the LDR requirement (6.0 mg/kg) at the time of disposal. There are no further LDR requirements for this soil. Data are presented in Appendix M of the RD/RA work plan DOE-ID-10643. There are RCRA-listed waste codes (Appendix H of the RD/RA work plan DOE-ID-10643) associated with the WWP sediments. These sediments remain within the area of contamination and no LDR requirements apply.

Table 2-1. (continued).

ARAR/TBC	Substantive Requirement(s)	A/R&A[a]	ARAR Implementation in RA
IDAPA 16.01.05.011 (40 CFR 268.40) Applicability of Treatment Standards Land Disposal Restrictions	Provides treatment standards for hazardous waste by hazardous waste code(s), including the waste description and treatment/regulatory subcategory, regulated hazardous constituent, and standards for both wastewaters and nonwastewaters.	A	No RCRA-listed or characteristic waste was encountered during the remedial action at the WWP, CP, CWP, SLP, or SLP Berm and SCA. The WWP contains RCRA-listed waste; however, clean fill material was previously placed over the WWP cells. Cutting and grouting the WWP influent lines was performed in a manner such that no internal surfaces of the piping were in contact with equipment. The activities during this remedial action did not result in any generation of or contact with RCRA-listed waste. The rest of these sites do not contain RCRA-listed or characteristic hazardous waste. The TAN soils contaminated with RCRA-F001 (TCE) listed waste were consolidated into the WWP Cell 1957 as part of the OU 10-06 CERCLA remedial action. The TCE concentration in the soils was less than the LDR requirement (6.0 mg/kg) at the time of disposal. There are no further LDR requirements for this soil. Data are presented in Appendix M of the RD/RA work plan DOE-ID-10643. There are RCRA-listed waste codes (Appendix H of the RD/RA work plan DOE-ID-10643) associated with the WWP sediments. These sediments remain within the area of contamination and no LDR requirements apply.
IDAPA 16.01.05.011 [40 CFR 268.45] Treatment Standards for Hazardous Debris Land Disposal Restrictions	Hazardous debris must be treated prior to land disposal as follows unless the Environmental Protection Agency (EPA) determines under 40 CFR 261.3(e)(2) of this chapter that the debris is no longer contaminated with hazardous waste or the debris is treated to the waste-specific treatment standard provided in this subpart for the waste contaminating the debris. Table 1 of this subpart provides a listing of alternative treatment standards for hazardous debris.	A	No RCRA-listed or characteristic waste was encountered during the remedial action at the WWP, CP, CWP, SLP, or SLP Berm and SCA. The WWP contains RCRA-listed waste; however, clean fill material was previously placed over the WWP cells. Cutting and grouting the WWP influent lines was performed in a manner such that no internal surfaces of the piping were in contact with equipment. The activities during this remedial action did not result in any generation of or contact with RCRA-listed waste. The rest of these sites do not contain RCRA-listed or characteristic hazardous waste. The TAN soils contaminated with RCRA-F001 (TCE) listed waste were consolidated into the WWP Cell 1957 as part of the OU 10-06 CERCLA remedial action. The TCE concentration in the soils was less than the LDR requirement (6.0 mg/kg) at the time of disposal. There are no further LDR requirements for this soil. Data are presented in Appendix M of the RD/RA work plan DOE-ID-10643. There are RCRA-listed waste codes (Appendix H of the RD/RA work plan DOE-ID-10643) associated with the WWP sediments. These sediments remain within the area of contamination and no LDR requirements apply.

Table 2-1. (continued).

ARAR/TBC	Substantive Requirement(s)	A/R&A[a]	ARAR Implementation in RA
IDAPA 16.01.05.011 [40 CFR 268.48] Universal Treatment Standards Land Disposal Restrictions	This section provides a table that identifies the hazardous constituents, along with the nonwastewater and wastewater treatment standard levels that are used to regulate most prohibited hazardous wastes with numerical limits. For determining compliance with treatment standards for underlying hazardous constituents as defined in 40 CFR 268.2(i), these treatment standards may not be exceeded.	A	No RCRA-listed or characteristic waste was encountered during the remedial action at the WWP, CP, CWP, SLP, or SLP Berm and SCA. The WWP contains RCRA-listed waste; however, clean fill material was previously placed over the WWP cells. Cutting and grouting the WWP influent lines was performed in a manner such that no internal surfaces of the piping were in contact with equipment. The activities during this remedial action did not result in any generation of or contact with RCRA-listed waste. The rest of these sites do not contain RCRA-listed or characteristic hazardous waste. The TAN soils contaminated with RCRA-F001 (TCE) listed waste were consolidated into the WWP Cell 1957 as part of the OU 10-06 CERCLA remedial action. The TCE concentration in the soils was less than the LDR requirement (6.0 mg/kg) at the time of disposal. There are no further LDR requirements for this soil. Data are presented in Appendix M of the RD/RA work plan DOE-ID-10643. There are RCRA-listed waste codes (Appendix H of the RD/RA work plan DOE-ID-10643) associated with the WWP sediments. These sediments remain within the area of contamination and no LDR requirements apply.

Table 2-1. (continued).

ARAR/TBC	Substantive Requirement(s)	A/R&A[a]	ARAR Implementation in RA
40 CFR 122.26 Stormwater Discharge Requirements	Storm water discharges are regulated under this citation. The substantive requirements for this remedial action are provided below. This remedial action activity falls under the definition in 40 CFR 122.26(b)(14)(x), "Construction activity including clearing, grading and excavation activities except: operations that result in the disturbance of less than five acres of total land area which are not part of a larger common plan of development or sale." 40 CFR 122.26(c)(1)(ii) requires that the operator of an existing or new storm water discharge that is associated with industrial activity under 40 CFR 122.26(b)(14)(x) is exempt from the requirements of 40 CFR 122.21(g) and 40 CFR 122.26(c)(1)(i). Such operator shall provide the following information: 1. The location (including a map) and the nature of the construction activity 2. The total area of the site and the area of the site that is expected to undergo excavation.	A	No permit was required. This is a CERCLA action and a permit is an administrative requirement. 1. The location of each site and maps are provided in Appendix A of the RD/RA work plan drawings. 2. The area of excavation for each site is provided in Appendix A of the RD/RA work plan drawings. 3. Covers were designed with uniform and continuous slopes with drainage basins to facilitate drainage and minimize erosion. Depending on the location, gravel/cobble/gravel layers or vegetative layers were also used to minimize erosion. 4. The sites have covers or fill of natural materials. Fill material and covers are less permeable than the natural subsoils to minimize contaminant migration. 5. The receiving water for storm water runoff from these project sites is the Big Lost River. Remedial action activities were performed in accordance with the project SWPPP (Appendix E of the RD/RA work plan DOE-ID-10643).

Table 2-1. (continued).

ARAR/TBC	Substantive Requirement(s)	A/R&A[a]	ARAR Implementation in RA
	3. Proposed measures, including best management practices, to control pollutants in storm water discharges that will occur after construction operations have been completed, including a brief description of applicable state or local erosion and sediment control requirements. 4. An estimate of the runoff coefficient of the site and the increase in impervious area after the construction is complete. The nature of fill material and existing data describing the soil or the quality of the discharge. 5. The name of the receiving water.		
IDAPA 16.01.01.651 Rules for Control of Fugitive Dust	All reasonable precautions shall be taken to prevent particulate matter from becoming airborne.	A	Dust suppression measures were implemented as necessary during the remedial action to minimize the generation of fugitive dust. These measures included water sprays, keeping vehicle speeds to a minimum, and work controls during periods of high wind.
IDAPA 16.01.01.500.02 Operation of, and Air Emissions from, Portable Equipment	Air emissions from portable equipment must comply with all applicable local, state, and federal rules and regulations.	A	IDAPA 16.01.01.500.01 discusses registration of portable equipment. Registration is not required for this CERCLA remedial action because it is an administrative requirement. This section also exempts internal combustion engines from this requirement. Portable equipment used on this project (generators, etc.) were not of sufficient size to require any further regulation. Other air quality regulations will be complied with as discussed in this ARARs table.
IDAPA 16.01.02.299(5)(a)(b) Idaho Groundwater Quality Standards	Protect groundwater and demonstrate that the water quality standards found in the Water Quality Standards will be met or achieved. All applicable groundwater standards are also identified in IDAPA 10.01.11.200, which supersedes the standards identified under this citation.	A	Computer modeling showed that through natural radioactive decay, natural attenuation, and dispersion, contaminants in the groundwater will steadily decrease to acceptable levels within the institutional control period of TRA. During this period, groundwater monitoring continues to be performed to verify that the contaminant concentration trends in the aquifer follow those predicted by the computer model. Existing institutional controls, which include land use and property restrictions, will continue to be maintained during the period of groundwater monitoring.

Table 2-1. (continued).

ARAR/TBC	Substantive Requirement(s)	A/R&A[a]	ARAR Implementation in RA
IDAPA 16.01.11.200 Idaho Groundwater Quality Rule	Protect groundwater and demonstrate that the water quality standards in the Idaho Groundwater Quality Rule will be met or achieved. Applicable standards for this remedial action include: Cadmium – 0.005 mg/L Chromium – 0.1 mg/L Mercury – 0.002 mg/L Co-60 – 218 pCi/L Tritium – 20,000 pCi/L Sr-90 – 8 pCi/L. According to IDAPA 16.01.11.004, "To the extent a conflict exists between this rule and the groundwater quality standards in IDAPA 16.01.02.299 of the Water Quality Standards and Wastewater Treatment Requirements, this rule shall prevail."	R&A	Computer modeling shows that through natural radioactive decay, natural attenuation, and dispersion, contaminants in the groundwater will steadily decrease to acceptable levels within the institutional control period of TRA. During this period, groundwater monitoring continues to be performed to verify that the contaminant concentration trends in the aquifer follow those predicted by the computer model. Existing institutional controls, which include land use and property restrictions, will continue to be maintained during the period of groundwater monitoring.
TO BE CONSIDERED			
DOE Order 5400.3[c] Hazardous and Mixed Waste Program	NA	NA	NA

Table 2-1. (continued).

ARAR/TBC	Substantive Requirement(s)	A/R&A[a]	ARAR Implementation in RA
DOE Order 5820.2A, Chapter III Low-Level Radioactive Waste Management	Provides guidance on disposal of low-level radioactive waste at DOE facilities.	NA	Radiological personal protective equipment and decontamination water was managed in accordance with the INEEL reusable property, recyclable materials, and waste acceptance criteria (RRWAC) and the *INEEL Radiological Control Manual* (INEEL 1996). Decontamination water was discharged to the ground surface within the area of contamination. Waste material/handling was minimized by sampling and field screening efforts to identify radionuclide contaminated soils above action limits. DOE Order 5820.2A, Chapter III was cancelled and replaced with DOE Order 435.1, *Radioactive Waste Management Manual*. Per Chapter I Section 2.E.5 of DOE 435.1; it states that "Environmental restoration activities performed pursuant to CERCLA which result in onsite management and disposal of radioactive wastes may demonstrate compliance with the requirements of DOE 435.1, *Radioactive Waste Management*, and this Manual through the CERCLA process." All substantive requirements of DOE Order 435.1 have been met through the OU-2-13 Remedial Investigation/Feasibility Study (RI/FS) and Remedial Design/Remedial Action (RD/RA) work plan.
DOE Order 5400.5 Radiation Protection Standards	Provides guidance on radiological environmental protection requirements, cleanup of residual radioactive material, management of waste, and release of property.	NA	Job Safety Analyses and/or Radiological Work Permits were prepared for tasks where there was the potential for exposure to radioactive contamination/materials. Radiological work permits were used as determined by the radiological control technician (RCT), based on the *INEEL Radiological Control Manual* (INEEL 1996).

a. A = applicable, R&A = relevant and appropriate

b. The CP has ARARs provided in the ROD for two alternatives. It wasassumed that containment with a native soil barrier would be the alternative that will be implemented.

c. This order was cancelled under DOE Notice 1321.139 on March 25, 1994 and not replaced. DOE Order 435.1 Radioactive Waste Management sets criteria for the management of the radioactive portion of mixed waste. In addition, RCRA and IDAPA ARARs provide the regulatory framework for addressing the hazardous component.

NESHAPS = National Emission Standards for Hazardous Air Pollutants.

2.3.1 Installation of Native Soil Cover

The native soil cover installed on the CP and SLP consists of three layers:

1. General backfill layer Type "B" (gravel and coarse sand) for the CP and Type "B," "C1,"and "C2" for the SLP. These soils were used to bring the ponds up to the design slope (rough grade)

2. Compacted low permeability soil layer or Type "A" soil

3. Topsoil layer or Type "A" that creates the final grade and allows for growth of the vegetative cover.

Approximately 13,020 m^3 (17,030 yd^3) of Type "B" soil was placed as well as approximately 6,300 m^3 (8,240 yd^3) of Type "A" soil to bring the CP up to final grade.

Approximately 4,664 m^3 (6,100 yd^3) of Type "C1" soil, 1,094 m^3 (1,431 yd^3) of Type "C2," 3,135 m^3 (4,100 yd^3) of Type "B," and 1,989 m^3 (2,600 yd^3) of Type "A" soil was used to bring the SLP up to final grade (see final grade drawing in Appendix C).

Type "C2" soil, which was radiologically contaminated, came from the SLP Berms. This soil was placed in the bottom of the SLP prior to any other soils.

2.3.2 Installation of Engineered Barrier Cover

WWP Cells 1952, 1957, and 1964 were required to be installed in three different phases.

2.3.2.1 Phase I. The first phase began in WWP 1964 Cell. Approximately 2,141 m^3 (2,800 yd^3) of Type "B" soil was placed. Upon completing the installation of the Type "B" soil, the subcontractor placed approximately 5,352 m^3 (7,000 yd^3) of riprap to complete the final grade of WWP 1964 Cell.

2.3.2.2 Phase II. The second phase began in WWP 1952 Cell. Approximately, 817 m^3 (1,069 yd^3) of pea gravel was placed followed by approximately 2,408 m^3 (3,150 yd^3) of cobble and another 1,220 m^3 (1,596 yd^3) of pea gravel (see Appendix A for borrow source sampling results). Once the subcontractor completed installation of the second layer of pea gravel, approximately 3,402 m^3 (4,450 yd^3) of riprap was placed to complete 1952 Cell.

2.3.2.3 Phase III. Prior to starting work in the WWP 1957 Cell, the subcontractor placed approximately 61 m^3 (80 yd^3) of radiologically contaminated soil from the North CWP (see Section 2.2.3). The subcontractor placed approximately 10,528 m^3 (13,770 yd^3) of Type "A" soil. This Type "A" soil brought 1957 Cell up to rough grade. Approximately 814 m^3 (1,064 yd^3) of pea gravel was placed, followed by approximately 2,408 m^3 (3,150 yd^3) of cobble and then approximately another 1,220 m^3 (1,596 yd^3) of pea gravel. Upon completing the second layer of pea gravel, the subcontractor placed approximately 3,402 m^3 (4,450 yd^3) of riprap to complete the 1957 Cell (see WWP final grade drawing in Appendix C). Completing WWP 1957 Cell tied all three cells together and created a continuous layer of riprap over all three cells.

2.3.3 Additional Components of the Remedial Action

The following sections describe additional components of the remedial action.

2.3.3.1 Warm Waste Pond. As stated in Section 2.3.2.3, approximately 61 m^3 (80 yd^3) of radiologically contaminated soil was placed in the WWP 1957 Cell prior to backfilling operations starting in the 1957 Cell. Before the soil was removed from the North CWP, the area was sampled. The areas sampled were defined in Appendix G (Post-Record of Decision Sample Data) of the RD/RA work plan for Test Reactor Area, OU 2-13.

The boundary of the radiological contamination was surveyed, and stakes were placed in the soil to mark the boundary. The subcontractor removed a 15.24 cm (6 in.) lift of soil totaling approximately 61 m^3 (80 yd^3). Upon removing this soil, samples were collected in the area of contamination and delivered to the TRA Radioactive Materials Laboratory (RML). The samples collected showed the area to be below FRGs. The location of each sample taken was surveyed for location. Sample results can be found in Appendix I.

2.3.3.2 Surface Grubbing. The ponds were grubbed in varying degrees. Grubbing removes surficial organic material to minimize void creation due to decomposition. Grubbing materials removed from the project were hauled to the existing CFA Bulky Waste Landfill.

2.3.3.3 Fill Material. Fill material was obtained from existing stockpiles located around the jobsite (TRA-10, -25, and -26), from the TRA pit, the Naval Reactor Facility pit and an offsite source for cobble. Samples were taken from each of these areas and analyzed for soil classification, soil moisture content, permeability, and size distribution. Per the earthwork specification, the fill material Type "A" was compacted to 95% of maximum dry density at 0 to +3 percent from optimum moisture content, as determined by the *American Society of Testing Materials* (ASTM)-D698, "Standard Proctor Testing" (ASTM 1996). For details of Borrow Source Sampling see Appendix A.

Fill material Type "B" was placed in the WWP 1957 Cell, 1964 Cell, CP and SLP. This material was placed with a tractor/scraper combination. The material was compacted with 5 passes from a smooth drum roller per specification 2200. Fill material Type "C1" was uncontaminated and "C2" soil was radiologically contaminated soil from the SLP berms. This material was placed in the bottom of the SLP in 15-cm (6-in.) lifts and compacted with a smooth drum roller a total of five passes. Once the radiologically contaminated soils were placed in the bottom of the SLP, the Type "B" soil was placed in the SLP. This soil was compacted with a smooth drum roller a total of 5 passes. The Type "B" soil was covered with a final layer of Type "A" soil. The Type "A" soil was taken from Environmentally Controlled Area (ECA) TRA-10.

The earthwork specification required the compaction and soil measure tests to be taken 10 times per acre per lift. One quality control check by sand cone method was required per 10 nuclear density tests. When a compaction or soil moisture test failed to meet the specification, the area was reworked and retested prior to any additional fill material being placed in the area. Final acceptance compaction and moisture content results can be found in Appendix B.

2.3.3.4 Placement of Native Geological Materials. WWP 1952 Cell and the 1957 Cell received two layers of pea gravel and one layer of cobble prior to installation of riprap. See Appendix A for sieve analysis of the pea gravel and cobble.

2.3.3.5 Placement of Riprap. The riprap required for the WWP area was obtained from the lava rock outcrop on the northeast corner of TRA. This site is known as ECA TRA-29. This source was closer to the work site than the recommended source and still met the specification requirements of 30 to 61 cm (12 to 24 in.) nominal diameters (see Appendix J, "Specification Section 2200," for riprap size requirements).

2.3.3.6 Monitoring Well Extensions. Wellhead casings were extended to accommodate the fill material that was added. The well heads were extended per Specification Section 2670 and Drawing C-15. Locations of the wells that were extended are found on contract plan drawings for each of the areas. After the wells were completed, the fixed guard posts around the wells were replaced to protect the wells from damage. In addition to the guard posts, a new concrete base was placed around the wellhead for protection of the well, in addition to providing a solid foundation for the survey monument.

2.3.3.7 Limited Action Sites. Per Table 1-1, TRA-15, TRA-19 and the Brass Cap Area were posted with signs. Two of these sites, TRA-19 and the Brass Cap Area will be retained for a contingent excavation and disposal option to be performed at a later date.

2.3.3.8 Posted Signs Permanent Markers. In lieu of fences, TRA-06, 13, 15, 19 and the Brass Cap Area were posted with signs.

- TRA-08 continues to be fenced as well as posted with signs
- TRA-03 and WWP Cell 1964 were posted and have permanent markers placed in three places around the perimeter of these areas.

2.3.3.9 Sewage Leach Pond. During remedial action at the SLP, it was determined to place six inches of clean Type A Fill material over the entire SCA. Prior to placement of the six inches of material, the agencies were informed during a WAG 2 weekly conference call and agreed to this action. There were three main reasons that the project team felt that this action was required: 1) to allow easy access around the SLP for the subcontractor; 2) to prevent additional spread of contamination; and 3) to support INEEL RadCon controlling air emissions of radiological fugitive dust (please refer to Section 4, CID 2-13-TRA-007).

2.3.4 Institutional Controls.

Some sites at TRA required institutional controls as part of the remedy. These sites and the basis for these institutional controls are listed in Table 2-2.

2.3.4.1 Types of Institutional Controls

Institutional controls include:

- Visible access restrictions
- Procedures to control activities
- Publishing of surveyed boundaries and controls in the INEEL Land Use Plan
- Notice to affected stakeholders
- Property lease and transfer regulatory requirements.

More details on what each institutional control involves are presented in the following sections.

Table 2-2. Sites with remedies requiring institutional controls.[a]

Site Code	Site Name	ROD Selected Remedy	Basis for Institutional Controls	Institutional Controls
TRA-03	TRA Warm-Waste Pond (Sediments)	Containment with an engineered soil cover and institutional controls	Containment barrier has been put in place. Current occupational risk is 2E-02. 100 year future residential risk is >1E-04.	Restrict site to occupational access for more than 30 years and restrict to industrial land use only until residential risk is <1E-04 based on the results of a 5-year review.
TRA-06	TRA Chemical Waste Pond (TRA 701)	Containment with a native soil cover and institutional controls	Native soil cover in-place. Hazard quotient greater than 1 for mercury via homegrown produce ingestion and soil ingestion at a depth of 14 feet.	Industrial land use is unrestricted. Restrict residential land use to depths less than 14 feet.
TRA-08	TRA Cold Waste Disposal Pond (TRA-702)	Excavation and disposal	Soil excavated and disposed of to 1E-04 future residential risk cleanup levels.	Restrict site to industrial land use for less than 100 years until residential risk is <1E-04 based on the results of a 5-year review.
TRA-13	TRA Sewage Leach Ponds (2) by TRA-732	Containment with a native soil cover and institutional controls	Containment barrier has been put in place. Current occupational risk is 1E-03 for Cs-137 and Ag-108. 100 year residential risk is 5E-04 at a depth of 14 feet. The hazard quotient (HQ) is greater than 1 for mercury and zinc via homegrown produce ingestion.	Restrict site to occupational access for more than 30 years and restrict to industrial land use only until residential risk is <1E-04 based on the results of a 5-year review.
TRA-15	TRA Hot Waste Tanks 2, 3, 4 at TRA-613 (TRA 713-B, 713-C, and 713-D)	Limited action.	Tanks still in use. Current occupational risk 3E-04, 100 year future residential risk is 1E-04. Additional contaminated soils are greater than 13 feet deep to basalt at 37 feet. Risk assessment is not done at this depth.	Restrict occupational access for less than 100 years until risk is <1E-04 based on a 5-year review. After the above restriction is removed, restrict land use at depths greater than 10 feet until otherwise evaluated.

Table 2-2. (continued).

Site Code	Site Name	ROD Selected Remedy	Basis for Institutional Controls	Institutional Controls
TRA-19	TRA Rad Tanks 1 and 4 at TRA-630, Replaced by Tanks 1, 2, 3, and 4 (TRA 730-1, 730-2, 730-3, 730-4)	Limited action with implementation of a contingent excavation and disposal option	New tanks still in use. Current occupational risk is 2E-01 for Cs-137. 100 year residential risk is 8E-02	Restrict occupational access and prohibit residential development until soil is removed or status is changed in a 5-year review.
None	Sewage Leach Pond Soil Contamination Area	Limited Action	2E-04 current occupational risk, 30 year occupation risk and 100 year residential risk is < 1E-04	Restrict occupational access until risk is <1E-04 based on the results of a 5-year review.
None	Brass Cap Area	Limited action with implementation of a contingent excavation and disposal option.	3E-01 current occupational risk and 8E-02 30 year future occupational risk. 8E-02 100 year future residential risk.	Restrict occupational access and prohibit residential development until removed or status is changed in a 5-year review.

a. Source of information is DOE-ID 1997b.

2.3.4.2 Visible Access Restrictions Visible access restriction institutional controls deal with visual signs or barriers that restrict personnel access to a specific waste site. In the case of WAG 2 OU 2-13, these restrictions will be warning signs and/or permanent markers. Brass corner markers are installed at the WWP and SCA. Aluminum signs 0.5 by 0.6 m (1.5 ft by 2 ft) with the site name and "Keep Out" are posted in multiple locations on the SLP, CP, and WWP Sites (12 at SLP, 8 at CP, and 18 at WWP). Additional warning signs on the other institutionally controlled sites clearly identify waste site number and point of contact and his/her phone number and include the statement "Do not disturb." In addition, four permanent granite markers are located on each side of the WWP (north, south, east, and west). Each marker is 0.9 by 1.2 by 3 m (3 by 4 by 10 ft) wide with an imbedded brass corner marker on the top. Each granite marker has three pictures on it indicating: (1) no walking, (2) poison, and (3) radioactivity.

2.3.4.3 Control of Activities Control of activity institutional controls are used to administratively control activities that can be performed at the waste site. These institutional controls cover all entities and persons, including, but not limited to employees, contractors, lessees, and visitors that access a controlled waste site. They cover all activities and reasonably anticipated future activities, including, but not limited to, any future soil disturbance, routine and nonroutine utility work, well placement and drilling, recreational activities, paving, training activities, construction, or renovation work on structures or other activities which might occur at a waste site.

These administrative controls include, but are not limited to:

- Procedures (including construction activities) that require a review and/or approval before activities can be performed at the waste site
- DOE-ID Directives.

2.3.4.4 INEEL Land Use Plan A map based on surveyed coordinates of the institutionally controlled waste sites and a list of the required institutional controls will be published in the INEEL Comprehensive Land Use Plan. The following will be included in this list: (1) the objective of the restriction or control, (2) the control or restriction, (3) the time frame that the restrictions apply, (4) the tools and procedures that will be used to implement the restrictions or controls and to evaluate the effectiveness of these restrictions or controls, and (5) a point of contact. All workers may visually see the affected areas and the access control procedures will reference these maps. The Land Use Plan will be used as a tracking mechanism for changes to land use and land use controls by controlling and documenting revisions to these maps. The Land Use Plan, located on the web, will be kept current by a Comprehensive Facilities and Land Use Plan (CFLUP) coordinator.

2.3.4.5 Notice to Affected Stakeholders

- Some waste sites require that special notification be made to affected stakeholders prior to any change in land use designation, land-use restriction, or users. When a land-use designation or restriction changes through the 5-year review process, affected stakeholders will be notified of that change. If and when the option Brass Cap Area (BCA), the EPA and the State of Idaho will be notified at least 6 months before the removal occurs. Specifics on the EPA and the State of Idaho's notifications of change in users are discussed further in Section 6, Leasing or Transfer of Property. The specific stakeholders include, but are not limited to the following:
- Bureau of Land Management

- Shoshone Bannock Tribal Council
- U.S. Fish and Wildlife Service
- Local county governments
- State of Idaho
- EPA.

2.3.4.6 Property Lease and Transfer Regulatory Requirements Property lease and transfer regulatory requirements are summarized in Section 6 of the O&M Plan (DOE-ID, 1999a).

2.4 Environmental Sampling and Analysis

The OU 2-13 Remedial Action Project environmental sampling and analytical results are discussed in the following subsections.

2.4.1 Sampling Objectives

The sampling objectives identified in the *Field Sampling Plan for Confirmation Sampling and Field Screening of Selected Sites at Waste Area Group 2 Operable Unit 2-13* (DOE-ID 1998a) were as follows:

The sampling objectives for the CWP included:

- Confirmation sampling will occur after the radiologically contaminated soil has been excavated. Most of the radiologically contaminated soil found from post-ROD sampling (DOE-ID 1998a) was in the first 15 cm (6 in.) of soil, and upon excavation no further contamination is expected. See Appendix H for CWP Sample Results.
- CWP confirmation samples will be analyzed by the INEEL Radiological Measurement Group.
- Confirmation sampling will be biased towards highest counts.

The sampling objectives for the SLP berm were as follows:

- Verify the remediated hot spots were below the FRGs for Cs-137
- Screen with a hand held sodium iodide (Nal) portable scintillometer during the remediation of the area to direct excavation activities
- Removal of material will occur until background radiation levels are achieved based on hand held instruments
- Samples results can be found in the RD/RA-work plan, Appendix G, DOE-ID-10643.

2.4.2 Quality Assurance

The quality assurance objective for the OU 2-13 Remedial Action Project sampling was to provide a sufficient quantity and quality of data to verify that FRGs had been met for the CWP and SLP berm. This was achieved by controlling sample collection, sample transfer, sample analysis, and data reporting.

The data acquired during the OU 2-13 Remedial Action Project were used to:

- Prove that contaminated soil above FRGs was removed from the CWP
- Confirmation that contaminated soil was removed to below the FRGs in the SLP berm.

2.5 OU 2-13 Remedial Action Sampling

2.5.1 Borrow Source Sampling

Soil Samples were collected from TRA-10, -25, and -26 in order to determine baseline moisture content as stated in 2.2.3 (see Appendix A).

2.5.2 North Cold Waste Pond Sampling

Samples were collected to verify all contamination was removed from the North CWP. These samples were collected per the Sampling Analysis Plan (SAP) for this project. Samples were delivered to the TRA Radiological Materials Laboratory (RML) and analysis was performed on the samples. These samples were found to be below the FRGs. These samples were retrieved from the TRA RML and placed back in the north CWP.

2.5.3 South Cold Waste Pond

Sampling of the South CWP was performed to identify concentrations of the COCs (Cs-137 and As), as identified in past sampling activities at the CWP (see RI/FS, Section 4.1.6.,(DOE-ID 1997a.) These samples were delivered to the TRA RML for analysis. Of the 11 samples collected, one sample was above the 23.3 pCi/g Cs-137 FRG. An additional sample was collected from the same area where the FRG of 23.3 pCi/g was exceeded. Four more samples were collected around the suspect sample location. These five samples showed no signs of radiological contamination above the FRGs. The sample that was above FRGs was delivered to the Radioactive Waste Management Complex (RWMC). Therefore, it is assumed the original radiologically contaminated sample removed the radiological contamination that was detected in the first round of sampling.

2.6 Occupational Sampling and Analysis

2.6.1 Industrial Hygiene Summary

The following sections discuss industrial hygiene (IH) airborne monitoring/sampling conducted on the OU 2-13 Remedial Action Project. The IH airborne monitoring/sampling was performed to determine and assess whether potential or real occupational exposure to noise, heat stress, and/or organic vapor fumes existed on this project.

2.6.1.1 Noise Surveillance. Because of the work activities involved on this project, it was possible to determine which employees would be at risk. Personnel operating heavy equipment and ground personnel could be exposed to average noise levels above 85 decibel for an 8-hour time-weighted average. Working in excess of the 85dB time-weighted average noise level exceeds the Occupational Safety and Health Administration (OSHA) 29 CFR 1910.95 standard, requiring the Project to implement the Company's Hearing Conservation Program. The project IH, in conjunction with subcontractor safety personnel, conducted routine noise assessments using the 'A' scale noise level measurements. The results of these noise assessments determined the need for hearing protection. Employees participating in the Hearing Conservation Program wore acceptable hearing protection. Prior to starting work, employees were required to have a baseline or current audiogram. As part of the Hearing Conservation Program, employees were required to be trained on the hazards of noise and the proper use and limitations of hearing protection.

2.6.1.2 Surveillance of Heat Stress. The majority of work on the OU 2-13 remedial action took place in the summer months. The HASP identified the need to ensure that employees were not being affected by heat stress. The IH and subcontractor safety personnel accomplished this through periodic surveillance. The subcontractor personnel were trained how to spot the signs and symptoms of heat stress and what to do for a potential victim. The subcontractor provided cool drinking water for the field personnel to ensure each employee was properly hydrated.

2.7 Decontamination

Upon exiting each area where radiological contamination was present, subcontractor personnel were required to perform personal surveys. Radiological Control Technician (RCT) was present when work took place in the areas containing radiological contamination. Once the contaminated soil was covered, the RCT performed periodic surveillances to verify that the subcontractor personnel were following the radiological procedures as required in PRD-3001 of the Subcontractors Requirement Manual.

2.8 Site Restoration

Reseeding was performed in early December. The subcontractor was required to reseed all areas that were disturbed during the construction of the engineered barrier cover. The fertilizer was applied at a rate of 30 pounds per acre. The seed was drilled to a maximum depth of 1.3 cm (0.5 in.). The seed mixture ("Critana" Teickspike Wheatgrass 5lbs, "Secar" Bluebunch Wheatgrass 5lbs, Northern sweetvetch 0.5lbs, Silverleaf lu7pine 0.5lbs, Wyoming big sagebrush 0.5lbs, Green rabbitbrush 0.5lbs) was placed for a total of 12 pounds per acre. For changes to seed mix please see appendix D pages D-86-D88. Straw mulch was applied at a rate of 2 tons per acre. Using crimping equipment, the straw was placed in the soil at a depth of 5 cm (2 in.). Where equipment was unable to be utilized, fertilizer, seed, and straw were applied by hand (i.e., in the ditch north of TRA near the riprap source area).

2.9 Demobilization

Upon completion of reseeding efforts and punchlist items, the subcontractor demobilized on December 23, 1999.

3. REMEDIAL DESIGN/REMEDIAL ACTION SUBCONTRACTOR COSTS

Total project costs for the OU 2-13 Remedial Action Project are listed below. This cost includes subcontractor labor and equipment.

3.1 Remedial Action Costs

Table 3-1 includes the subcontracted costs for the actual work performed. Subcontractor mobilization/demobilization costs are provided in Table 3-1. Surface water control cannot be broken out as it is a cost of actual capping efforts and is included in these costs. Surface water control was not required to be a line item cost in the subcontractor vendor data. Total costs including management, construction oversight, and remedial action subcontractor totaled a little less than $2 million.

Table 3-1. Summary of Remedial Action Costs.

Item	Price
Training	$ 44,800.00
Mobilization	39,200.00
Well extensions	10,200.00
Chemical Waste Pond	
Fence removal/disposal	1,400.00
Clearing and grubbing	6,800.00
Pipe abandonment	1,250.00
Berm and Type "B" soil placement	97,922.50
Type "A" soil placement	31,312.00
Sign/corner marker installation	2,900.00
Revegetation	1,138.50
Sewage Leach Pond	
Fence removal disposal	2,290.00
Clearing and grubbing	13,600.00
Pipe/manhole abandonment	1,500.00
Type C2 placement	42,930.00
Type C1 placement	28,670.00
Type "B" placement in SCA	2,422.00
Type "B" placement in pond	26,928.00
Type "A" placement	9,360.00
Sign/corner marker installation	3,285.00
Revegetation	2,623.50

Table 3-1. (continued).

Item	Price
Cold Waste Pond	
Clearing and grubbing	1,282.00
Soil excavation	7,480.00
Warm Waste Pond	
1952 Cell	
Pipe abandonment	11,404.00
Clearing and grubbing	9,420.00
1957 Cell	
Fence removal	1,410.00
Clearing and grubbing	3,770.00
Type "A" soil placement	58,522.50
1952 and 1957 Cells	
1st and 2nd gravel layer placement	69,160.00
Cobble layer placement	160,020.00
1964 Cell	
Type "B" soil placement	19,180.00
1952, 1957, 1964 Cells	
TRA riprap source placement	127,200.00
Sign/corner marker installation	5,740.00
Permanent markers	18,575.00
Revegetation	4,950.00
Demobilization	27,600.00
Labor	461,730.51
Sales/Use tax	4,189.64
Subcontracts	23,530.98
Materials	123,852.16
Equipment	282,575.71
Total	$895,879.00

4. MODIFICATIONS TO THE REMEDIAL ACTION

Several modifications to the RA work plan were required during the course of the project. These modifications were generated due to changes in field conditions and/or new information brought to the attention of the construction engineer or CC in the field. These changes were documented and approved using Construction Interface Documents. See Appendix D for copies of the following Construction Interface Documents:

2-13-TRA-001: Revised Section 14 of the subcontract and the specification Section 2200, section 1.3.4 changed the need for original field notes to copies of the field notes. The original notes must remain in the possession of the professional land surveyor for liability reasons.

2-13-TRA-002: Deleted the need to perform soil gradation on Types C1 and C2 soils from the SLP as this could potentially spread contamination.

2-13-TRA-003: Drawing C-08 was revised to perform the grouting of abandoned piping outside the underground radiological materials area (RMA) as the original excavation location may have potentially contaminated equipment and/or personnel.

2-13-TRA-004: Because of operational needs, the CP was not available to begin work until May 1, 1999. The subcontractor was directed to resubmit the baseline schedule.

2-13-TRA-005: Directed the subcontractor to purchase an electrical breaker for power to the subcontractor trailer.

2-13-TRA-006: Directed subcontractor to cut the weeds in the south CWP. This work needed to be performed prior to releasing water into this pond.

2-13-TRA-007: Directed subcontractor to place additional Type "A" soil in the SCA of the SLP. This was performed so there would not be a SCA around an underground RMA.

2-13-TRA-008: Directed the subcontractor to supply a generator in order to furnish power to the jobsite trailer.

2-13-TRA-009: Directed subcontractor to pick up and deliver government furnished equipment (GFE) bulldozer to the jobsite.

2-13-TRA-010: Revised specification section 2200 to percent passing as follows: 1.9 cm (0.75 in.) gravel 95 to 100%, 1.2 cm (0.50 in.) gravel 70 to 100%, 0.94 cm (0.37 in.) gravel 25 to 70%, and No. 4 gravel 0 to 15%.

2-13-TRA-011: Directed subcontractor to install approximately 152 m (500 ft) of drainage ditch and clean out five culverts. This ditch was installed to improve the 100-year flood plain drainage plan.

2-13-TRA-012: Directed subcontractor to remove fence posts around the SLP.

2-13-TRA-013: Directed subcontractor to paint guard posts around the corner markers.

2-13-TRA-014: Directed the subcontractor to remove concrete debris from the riprap area.

2-13-TRA-015: Directed subcontractor to purchase socket welded couplings for two well extensions and to extend one of the wells with galvanized piping.

2-13-TRA-016: Directed subcontractor to deliver 76 m^3 (100 yd^3) of topsoil into TRA for maintenance of stormwater ditches.

2-13-TRA-017: Directed subcontractor to place approximately 15 cm (6 in.) of topsoil over the riprap source area. Topsoil was needed to support growth of vegetation.

2-13-TRA-018: Directed subcontractor to clear and grub area around decon pad, install concrete ramp, step off pad, purchase drum handler, and excavate trench from decon pad to lift station pad. Work performed was to support the installation of a Temporary Accumulation Area (TAA). The TAA was needed to provide compliant storage of groundwater that was generated as the result of monitoring well purging activities.

2-13-TRA-019: Directed subcontractor to revise seed mixture to use all native grasses. Changed specification section 2930.

2-13-TRA-020: Directed subcontractor to relocate fence on northwest corner of WWP 1952 Cell.

2-13-TRA-021: Paid subcontractor to shut down work and attend security stand-down meetings.

2-13-TRA-022: Paid subcontractor for safety stand-down. Work was shut down site-wide due to an accident on another project.

2-13-TRA-023: Directed subcontractor to remove old tires from riprap area. These tires were used in the blasting of the foundation for buildings inside TRA.

2-13-TRA-024: Directed subcontractor to modify ditch at northwest corner of TRA perimeter fence. Sloped ditch to 4:1 slope to support growth of vegetation.

2-13-TRA-025: Directed subcontractor to remove sump and T-post fence near decon pad.

2-13-TRA-001*: Was voided in its entirety.

2-13-TRA-002*: Revised seed mixture. This mixture was changed because certain grasses in the mixture were unavailable.

2-13-TRA-003*: Directed the subcontractor to reseed the area north of TRA. This area was killed with a herbicide and needs to be revegetated to comply with the storm water permit. This area is known as ECA (Environmentally Controlled Area) –34.

2-13-TRA-004*: Directed the subcontractor to reseed additional areas around the riprap source.

*Denotes the contract change from LMITCO to BBWI

5. QUANTITIES AND TYPES OF WASTES GENERATED

5.1 Personal Protective Equipment

Personal protective equipment requirements for the OU 2-13 Remedial Action Project were identified in the HASP as Level D. Therefore, no personal protective equipment waste was generated during this project.

5.2 Diesel Fuel Spill

During project construction, a fuel truck was refueling a piece of heavy equipment. The operator of the fuel truck overfilled the equipment, spilling approximately 38- to 57-L (10- to 15-gal). The subcontractor began cleanup procedures immediately and notified the CC. The CC then notified the Spill Response Team. The Spill Response Team informed the CC that the size of the spill was not recordable and that the waste should be disposed of in the petroleum-contaminated landfarm near the Bulky Waste Landfill. The subcontractor stored the waste in a drum provided by the CC. Upon completion of the INEEL Form 669, "Material and Waste Characterization Generators Certification and Information," the ECC directed the subcontractor to place the waste in the petroleum-contaminated landfarm (see Appendix G for details).

5.3 Radiologically-Contaminated Waste

Approximately 76 m (250 ft) of 1-inch cable was removed from the SLP berm area, and placed in a radioactive waste bin. The bin was placed in a RMA that had been established within the SCA area of Contamination (AOC). The bin was then moved inside TRA where additional TRA Operations low-level radiological waste was added to the box. Once the box was filled, the box was sent to the RWMC for disposal.

5.4 Noncontaminated Project Waste

Noncontaminated project waste includes paper, excess materials, soil that was not used for fill material (i.e., grubbed material off the top of each ECA), and miscellaneous scrap metals were transported to the CFA Bulky Waste Landfill for disposal. In addition to the waste that was transported to the CFA Bulky Waste Landfill, several loads of metal fence posts where delivered to the Excess Property Warehouse for recycling.

6. DISCUSSION OF PREFINAL INSPECTION ITEMS

The prefinal inspection for the OU 2-13 Remedial Action Project was completed in August 1999 (see Appendix F for Prefinal Inspection Checklist). Representatives from the DOE, EPA, IDHW, INEEL Maintenance and Operations (M&O) Contractor, and subcontractor performed the inspection. The following items were identified as incomplete at the time of the inspection.

- Field placement test results (these results had not yet been submitted)
- Field quality control results (these results had not yet been submitted)
- Field records for surveying, layout, laboratory and field records of inspection
- All areas requiring vegetation have not been revegetated.

The above items were completed by December 1999. The field placement test results, field quality control results, and field records for the surveying are in Appendix B. The areas requiring vegetation were revegetated prior to the subcontractor demobilizing from the jobsite.

The prefinal inspections had been completed prior to the subcontractor demobilizing from the site, and the subcontractor was able to perform the few subcontractor-related items identified as outstanding during the prefinal inspection. The WAG managers concurred on how to resolve these and other outstanding items during the inspection and identified the corrective action measures to be implemented. DOE-ID, because of their location at the INEEL, reviewed and acknowledged the completion of the outstanding items. This serves as notice to the completion of the prefinal inspection report. Please see Appendix F for changes made to the prefinal inspection checklist that reflect work performed to complete the punchlist.

7. SUMMARY AND VERIFICATION OF WORK PERFORMED

The primary work activities for the OU 2-13 Remedial Action Project included hauling fill material to bring the ponds up to grade as well as placing gravel, cobble, and riprap, as specified in the contract documents. This section identifies the documents that verify the work completion.

7.1 Summary of Work Performed

During the process of constructing the engineered barrier cover for the OU 2-13 Remedial Action Project, the subcontractor's CC performed oversight on a daily basis. In addition to the CC, several other representatives were onsite from time to time. The representatives were as follows: (1) subcontractor project manager (PM); (2) M&O contractor PM; (3) DOE PM; and (4) representatives from Idaho Department of Health and Welfare (IDHW) Division of Environmental Quality and EPA. All work on this project was performed under specifications that had different vendor data requirements. The subcontractor was required to submit vendor data and to obtain approval prior to proceeding with the next work scope. This approval cycle went through the subcontractor PM and M&O contractor PM. The approval cycle also included the safety and quality departments, as needed. The vendor data was used to verify the work completion per the specifications and to document the work for the project files. In addition, as-built drawings were submitted for approval. These drawings verified the conformance to the specifications by specifying the coordinates and elevations of different points on the landfills. This type of approval and the verification process in Section 7.2 provides verification that the work was performed to the specifications.

7.2 Verification of Work Performed

Verification of the work performed was documented throughout the duration of the project. The subcontractor CC and job site supervisor maintained daily force reports that detailed the work activities, quantities of fill material, number of personnel onsite, schedule and equipment issues, and any other potential coordination items that needed to be addressed. These daily force reports and plan of the day meeting report forms can be found in the contract files. In addition, the subcontractor was required by the specifications to perform inspections of different phases of fill material placement. Test reports can be found in Appendix B.

7.2.1 Placement of Fill Material

Samples of the fill material from the borrow area were analyzed for soil classification, moisture content, and permeability (see Appendix A). After the test results verified that the soil was within specification, it was hauled to the WWPs, SLP, and CP. Water was added to enable the soil to be compacted to 95% of the maximum dry density. A sample of the test results can be found in Appendix B.

Elevation surveys were performed on each lift to verify that it was being placed within tolerance. Each lift was submitted and approved in the Vendor Data Schedule prior to the next lift placement. Test results can be found in Appendix B.

8. CERTIFICATION THAT REMEDY IS OPERATIONAL AND FUNCTIONAL

As stated in the OU 2-13 ROD, the remedial action objectives (RAO) and the final remediation goals were established to reduce or eliminate the risk to human health and the environment. To ensure current or future exposure to human heath and the environment do not exceed the RAOs, access restrictions and environmental monitoring for the WWP, CP, SLP, TRA-15, TRA-19, Brass Cap Area, and the SLP-SCA are established per the OU 2-13 Operations and Maintenance Plan (DOE-ID 1999b). For the WWP, CWP, SLP, TRA-15, and the SLP-SCA these access restrictions will be maintained until such time that the radionuclides, causing the risk, decay to unrestricted land use concentrations. For TRA-19 and the BCA access restrictions will be maintained until such time that the contingent excavation/disposal options as identified in the OU 2-13 ROD is implemented. Since the COC at the CP is mercury for the home grown produce, to ensure that the RAOs are met, land use restrictions will be placed on this pond to ensure that no activities will be performed at this site requiring excavating greater than 15-ft below land surface.

This report certifies that the remedies selected in the OU 2-13 ROD (DOE-ID 1997a) and detailed in the OU 2-13 RD/RA Work Plan (WP) (DOE-ID 1998c) have been completed and the remedies are operational and functional. To ensure that the remedies remain protective to human health and the environment, institutional controls and operations and maintenance of the remedial action sites will be implemented as outlined in the OU 2-13 Operations and Maintenance Plan (DOE-ID 1999b).

9. REFERENCES

29 CFR 1910.95, "Occupational Safety and Health Administration Standard," *Code of Federal Regulations*, Office of the Federal Register.

ASTM, 1996, American Society of Testing Materials D-698 "Standard Proctor Testing."

CERCLA, 1980, Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986

DOE-ID 1997a, Final Record of Decision Declaration for Test Reactor Area Operable Unit 2-13, U. S. Department of Energy Idaho Operations Office, DOE/ID-10586, December, Revision 0.

DOE-ID 1997b, Comprehensive Remedial Investigation/Feasibility Study for Test Reactor Area Operable Unit 2-13 at the Idaho National Engineering and Environmental Laboratory, U. S. Department of Energy Idaho Operations Office, DOE/ID-10531, February, Revision 0.

DOE-ID, 1998a, Field Sampling Plan for Confirmation Sampling and Field Screening of Selected Sites at WAG 2, Operable Unit 2-13, U. S. Department of Energy Idaho Operations Office, DOE/ID 10657, September, Revision 0.

DOE-ID, 1999a, Remedial Design/Remedial Action Work Plan for Test Reactor Area Operable Unit 2-13, US. Department of Energy Idaho Operations Office, DOE-ID 10643, September, Revision 0.

DOE-ID, 1999b, Operations and Maintenance Plan for the Final Selected Remedies and Institutional Controls at Test Reactor Area, Operable Unit 2-13, U.S. Department of Energy Idaho Operations Office, DOE/ID-10658, March, Revision 3.

DOE-ID, 1998c, Comprehensive Remedial Design/Remedial Action Work Plan for Test Reactor Area 9 Operable Unit 2-13, U. S. Department of Energy Idaho Operations Office, DOE/ID-10643, September, Revision 0.

IDAPA, 1972, "Rules for the Control of Fugitive Dust and General Rules, "Idaho Administrative Procedures Act Sections 16.01.01.650 and 01.651.

IHWMA, 1983, Idaho Hazardous Waste Management Act, "Landfills, Closure, and Post Closure" (derived from 40 CFR 264.310).

INEEL, Radiological Control Manual, current issue.

INEEL, Emergency Plan/RCRA Contingency Plan, current issue.

Appendix A

Borrow Source Sampling

PARSONS INFRASTRUCTURE & TECH. GROUP INC.
RD/RA SERVICES

FROM THE DESK OF
Martin Doornbos

March 26, 1998

To: Craig Reese

Subject: TRA Warm Waste Pond Cover - 52 Cell

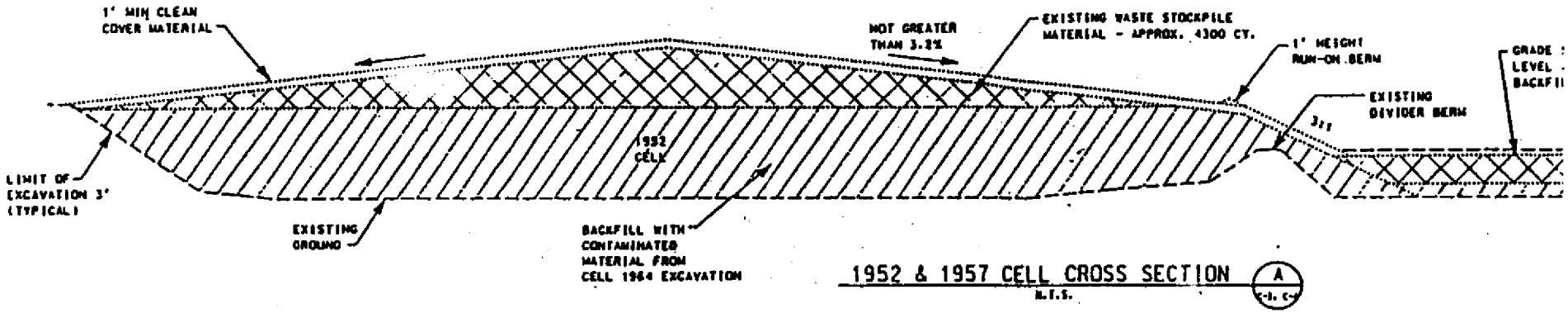
A description of the backfill and capping operation for the Warm Waste Pond (52 Cell) is provided in the *Final Remedial Action Report for the Warm Waste Pond Interim Action* (02.010.2.1.209.01). Basically, contaminated soils from the 64 Cell were placed in the bottom of the pond, followed by a layer of low-level radioactively contaminated surface soils that were collected from an area located to the east of the pond. Finally, the contaminated soils were covered with a one foot thick layer of clean cover material. A cross-section illustrating the as-built condition of the 52 Cell is attached.

According to Lynn Higgins (Project Manager, OU 2-10 Remedial Action Project), the clean cover material is a minimum of 12-in. thick and consists of two layers. A lower 8-in. thick layer of clean soil taken from the "South Clean Fill Stockpile" and an upper 4-in. thick layer of clean soil taken from the "North Clean Fill Stockpile". The locations of these two stockpiles are identified in the attached figure.

For the upcoming OU 2-13 Remedial Action Project, these two stockpiles have also been identified as borrow sources. The "North Clean Fill Stockpile" and the "South Clean Fill Stockpile" are identified as borrow sources TRA-10 and TRA-23, respectively, for the OU 2-13 remedial action. Representative samples of this material have been collected and are currently being tested for the following:

- Grain size distribution
- Standard Proctor
- Permeability (85%, 90%, and 95% compaction
- Atterberg Limits

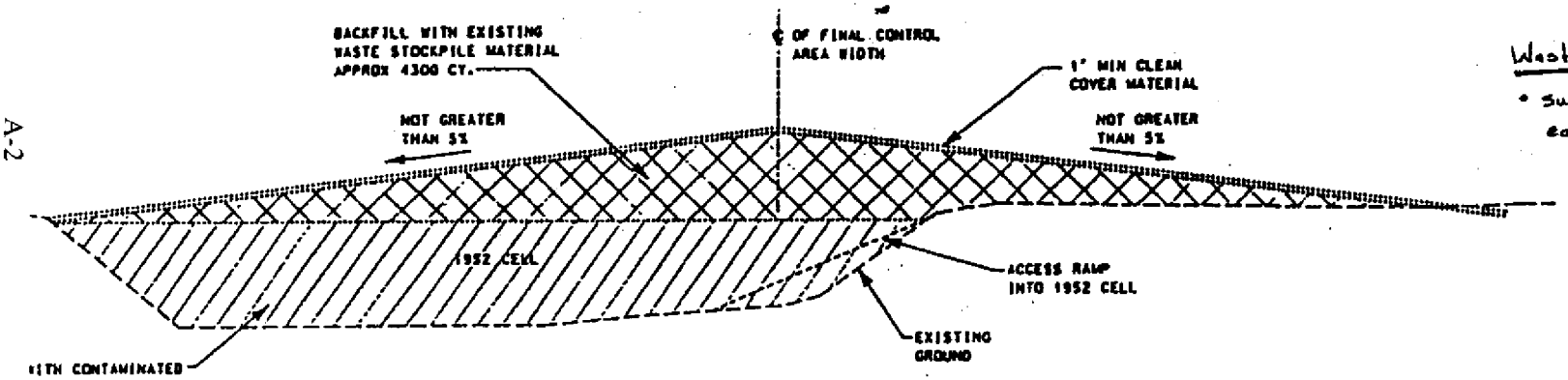
These data, combined with in-situ density measurements of the 52 Cell cover, should provide a reasonable estimate of the cover's permeability for comparison with the underlying sediments.



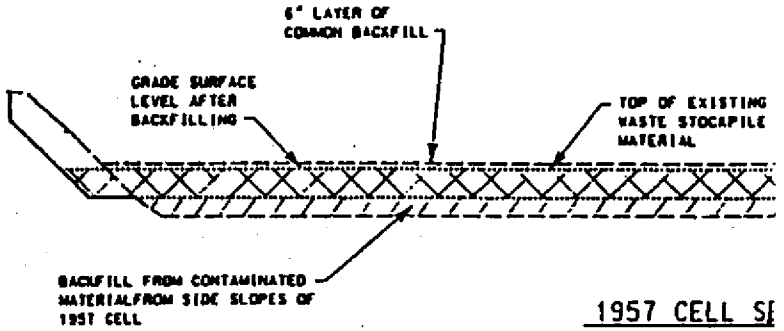
1952 & 1957 CELL CROSS SECTION (A)
N.T.S.

Cover Material (CL. Higgins, 3/
- top 4-in. from "North Clean S
- lower 8-in from "South Clean S

Waste Stockpile:
- surface contaminated soil f
east of the 52 cell



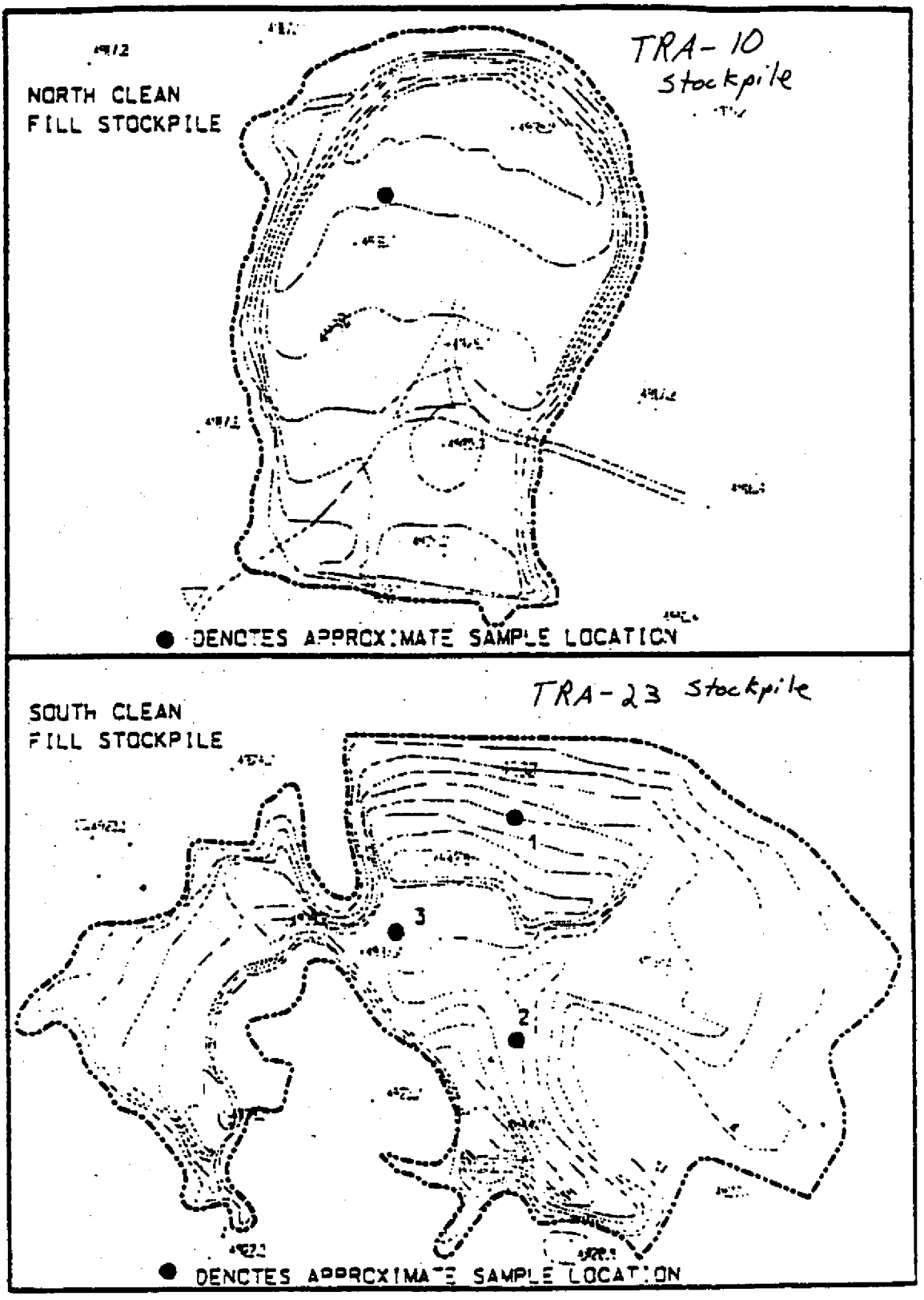
1952 CELL SECTION (B)
N.T.S.



1957 CELL SE
N.T.S.

A-2

Figure 2-2 Clean Fill Stockpile Sample Locations



REPORT ON SOIL TESTING

For the

TRA WARM WASTE POND

REMEDIATION

By

HC Bean

CFA 602 Materials Testing Lab

526-2588 ms 4136

1.0 Overview and Scope of Work

Testing of the stockpiled soils along the east fence perimeter of the TRA complex was requested by Craig Reese and Pat Taylor of Parsons Environmental. This testing was to consist of sampling the various stockpiled soils around the TRA Warm Waste Ponds, classifying the soils and conducting Moisture-Density Curves and Permeability tests on these soils at various re-molded densities to determine a relationship between density of the soils and the hydraulic flow rate of water.

The stockpiled materials located around the warm waste ponds consist primarily of the alluvial soils common in and around the TRA area. From the appearance of the various stockpiles, these materials probably originated from the construction of the waste ponds and/or other TRA excavations. The stockpiled materials that have been requested for sampling and testing are from the following areas:

TRA 25 stockpile

TRA 26 stockpile

TRA 23-ETR stockpile

TRA 10 stockpile

Additional sampling and testing was requested of the current CFA gravel pit, State of Idaho gravel sources BN-127-S, BN-33-S, BU-26 and "chip" piles from the INEEL Dairy Farm and the NRF/Lincoln Road gravel pit.

Sampling of the State of Idaho gravel sources was intended to identify a source of "chips" or "pea-gravel". The testing of the NRF/Lincoln Road pit and the Dairy Farm was also to identify and characterize the chip piles at these locations for usage in a Bio-Barrier engineered system. In addition to the above tests, samples of various "cobble" materials from the Monroc, Valley and Walters Ready Mix companies located in Idaho Falls and Rexburg.

The result of the testing that has been conducted on the above samples has indicated a wide variety of soil types. The following pages will outline the tests that were conducted on each of the samples, and the results of the testing.

Testing of the various stockpiles and soils for potential use on the TRA Warm Waste Pond Remediation was conducted to the following list of tests and related standards.

Name of Test	Test Standard
Gradation Analysis	ASTM D-422
Percent Fines	ASTM D-1140

Atterberg Limits	ASTM D-427
Soil Description	ASTM D-2488
Soil Classification	ASTM D-2487
Moisture/Density Curves (Proctor-compaction curves)	ASTM D-698
Permeability's (Both Falling Head and Constant Head)	ASTM D-2434 and Reference 18

2.0 Test Results

Gradation Analysis ASTM D-422

Gradation analysis and results of the samples collected from all of the various stockpiles and/or gravel sources are attached to this report for engineering evaluation of the soil types in question. A brief breakdown of the samples tested is as follows:

Sample ID	% Gravel	% Sand	% Fines
TRA 25	61.5	34.9	3.6
TRA 26	59.7	34.3	6.0
TRA 23	50.5	30.5	19.0
TRA 10	22.7	34.7	42.6
CFA Pit	50.0	45.5	4.5

Gradations for Cobbles:

Cobbles were sampled from Monroc and Valley Ready Mix plants located Idaho Falls, and from the Walters Ready Mix pit located along the Jefferson/Bingham county line road for use as part of an engineered Bio-Barrier. Cobbles were not tested specifically to an ASTM test procedure due to their large size. We used plates with 2", 4", 6", 8" and 10" openings. The results of these "gradations" are as follows:

Sample ID	% plus 2"	% plus 4"	% plus 6"	% plus 8"	+ 10"
Monroc, IF	100	54.3	12.8	0	0
Valley, IF	100	52.4	7.1	0	0
Walters	94.1	9.8	0	0	0

Gradations of Chip Piles:

Chip piles located in three of the State of Idaho Transportation Dept. aggregate sources were tested for usage as part of an engineered Bio-Barrier. These aggregate piles were predominantly one or two sizes of aggregate. A fourth chip pile, located at the INEEL Dairy Farm was tested as well. The source of the Dairy Farm chip pile was Walters Ready Mix, Rexburg. A fifth sample of slightly coarser chips was tested from the NRF Lincoln Road pit located north of NRF. The results of these tests are as follows:

	Percent Passing						
Sample ID	.75"	.50"	.375"	#4	#8	#16	#200
State Pit BN-127-S	100	100	98.9	11.4	0.7		0.0
State Pit BN-33-S	100	100	99.3	22.0	5.0		0.0
State Pit BU-26	100	100	98.7	6.3	1.8		0.0
Dairy Farm	100	100	100	15.5	1.6	1.2	0.0
NRF Lincoln Road Pit	100	86.1	39.7	1.0			0.0

Moisture/Density (Proctor) Curves ASTM D-698

Moisture/Density curves, commonly known as Proctor curves are used to establish a Maximum Dry Density and Optimum Moisture Content of a particular soil type for use in re compacting the soils to a minimum in-place density, usually 95%.
Testing of samples from the TRA Remediation Area for moisture/density curves was conducted on TRA 25, 26, 23 and 10 stockpiles. This information can be used for future compaction efforts during the Remediation work. Curves were also developed for the CFA Gravel Pit material, which will be used extensively for this Remediation.

The test results included with this report show both a corrected and uncorrected maximum dry density. This "corrected" density is the result of correcting the sample for oversize (plus ¾") materials. Results of the testing are as follows:

Sample ID	Maximum Dry Density (lbs./cu.ft.)		Optimum Moisture %	
TRA 25	139.6 (corrected)	132.3 (uncorrected)	4.6%	6.4%
TRA 26	140.7 "	133.8 "	4.9%	6.7%
TRA 23	137.3 "	131.2 "	6.0%	7.8%
TRA 10	118.7 (no correction applied)		10.0%	
CFA Pit	134.2 (corrected)	130.2 (uncorrected)	5.6%	6.6%

Atterberg Limits ASTM D-427

Atterberg Limits, in relation to the soil samples taken from the TRA areas in question were conducted on only two of the samples. These two samples were the TRA 23 stockpile and the TRA 10 stockpile. Atterberg Limits (plastic and liquid limits) are an indication of the ability of a soil to have plastic and/or liquid tendencies. If there is a sufficient amount of fine soil particles in a given sample that have plastic and/or liquid tendencies, these soils can have low to very low permeabilities. The results of the two samples ran for these criteria are as follows:

Sample ID	Liquid Limit	Plastic Limit	Plasticity Index
TRA 23	18	14	4
TRA 10	19	14	5

Soil Classifications: ASTM D-2487 & 2488

The soil classifications given here are a result of the tests that have been conducted on these samples, and a visual examination of the samples. The classifications listed are the USCS (Unified Soil Classification System) and the AASHTO (American Association of State Highway and Transportation Officials). The results listed indicate a fairly wide variety of existing soils in the immediate TRA Remediation area. This may be to an advantage for engineering as they apply these various soils to achieve specific results.

Sample ID	USCS	AASHTO	Soil Description
TRA 25	GW	A-1-a	Well graded gravel with sand
TRA 26	GW-GM	A-1-a	Silty gravel with sand
TRA 23	GC-GM	A-1-b	Silty, clayey gravel with sand
TRA 10	SC-SM	A-4(0)	Silty, clayey sand with gravel
CFA Gravel Pit	GP	A-1-a	Poor graded gravel with sand

Permeability of soils ASTM D-2434 & Ref. 18

Testing of the TRA stockpile samples for permeability rates were performed using standard 6" and 4" re compaction molds. The samples were re molded to at least two different densities and moisture contents in an attempt to cover a range of construction compaction requirements. A hydraulic head of 12"-18" was established for testing the permeability of these samples. A complete review of the test results and permeabilities will be included at the end of this report. Following is a brief chart indicating the results of the permeability tests conducted.

Sample Location	Compacted Moist. %	Blows per layer	Mold size inches	Molded density Of sample – Lbs./cu.ft.	% comp.	Permeability Cm/sec
TRA 26 stockpile	3.0%	10	6"	120.2	90	2.50×10^{-3}
TRA 26 stockpile	6.3%	20	6"	131.0	98	1.15×10^{-3}
TRA 25 stockpile	5.1%	12	6"	118.8	89.8	1.28×10^{-2}
TRA 25 stockpile	4.6%	30	6"	125.6	95.0	8.23×10^{-3}
TRA 23 stockpile	6.0%	10	4"	114.8	87.5	9.39×10^{-5}
TRA 23 stockpile	6.0%	20	4"	121.0	92.2	9.51×10^{-6}
TRA 10 stockpile	9.0%	10	4"	107.2	90.3	6.06×10^{-5}
TRA 10 stockpile	9.2%	20	4"	119.6	100.8	3.32×10^{-6}

3.0 Summary of Test Results and Recommendations

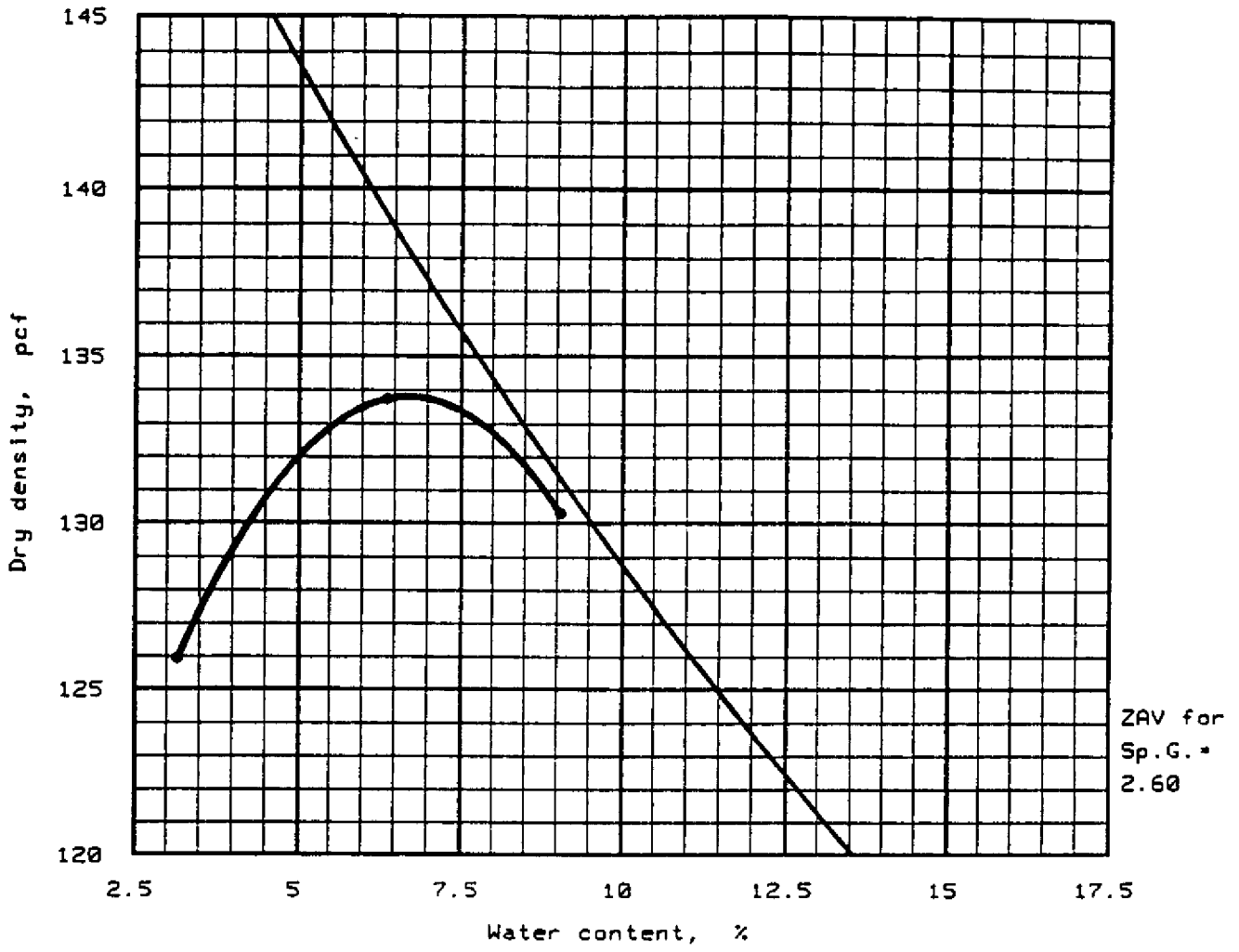
The stockpiles located near the perimeter of the TRA area indicate a range of soil types that may be of benefit to the remediation effort for the waste ponds. The stockpile samples from the TRA 25 & 26 areas appear to be very similar in classification and properties. These gravel piles are classified the same as the surrounding natural alluvial gravel that is located east of the TRA perimeter. These gravel deposits vary in depth and location, but in general, these two stockpiles appear to be from the surrounding deposits. Because of the open texture, (pore/void ratio), these clean, sandy gravels will have nearly the same permeability rate throughout the normal ranges of compaction requirements. Because of the depth and locations of the ponds, it is our feeling that the ponds were built/excavated from these gravel deposits and should have an average in-place density of around 120 lbs./cu.ft.

The stockpile TRA 23 is a more "dirty" material. This stockpile is the same alluvial gravel deposits as TRA 25 & 26, but with a little more of the overlying fine-grained soils found also east of the TRA perimeter. This soil will have a lower permeability if compacted to the same densities as TRA 25 & 26, but not as low as the material from the TRA 10 pile.

The stockpile TRA 10 consists primarily of sands, silts and some clays with gravel. This material has a permeability rate much lower than the TRA stockpiles 25 & 26, and TRA 23. This material, if compacted properly with close attention being paid to the compaction moisture, should make a substantially lower permeability layer than the alluvial gravels.

Permeability is a function of pore space, shape and size, particle shape and size, and homogeneous nature of the surrounding stratum. In a field setting, the mass permeability of a soil structure is a function of the particular features of the soils in question. These features vary from discontinuities, sand lenses, silt/clay lenses, vegetative matter and differing soil layers. These features may not be represented in these test samples, therefor it is imperative that the results of these tests are evaluated for proper usage in any future remediation work. Hopefully this information is beneficial to the Waste Pond Remediation work. If there is additional information on these TRA soils that we can help you with, please contact us at 526-2588, ms-4136.

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Method C, Standard
Oversize correction applied to final results

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in	% < No.200
	USCS	AASHTO						
	GW-GM	A-1-a		2.60	NV	NP	26.8 %	6.0 %

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 140.7 pcf Optimum moisture = 4.9 %	Pit run gravels, silty gravels with sand.

Project No.: 3XAC13103
Project: TRA Warm Waste Pond Remediations
Location: TRA area, east of perimeter fence.
Rubble pile 26.
Date: 4-08-1998

Remarks:
Sampled by R.T. Jones
from rubble stockpile
26 near sewer system.

MOISTURE-DENSITY RELATIONSHIP TEST

INEL MATERIALS LAB

Fig. No. _____

PROJECT DATA

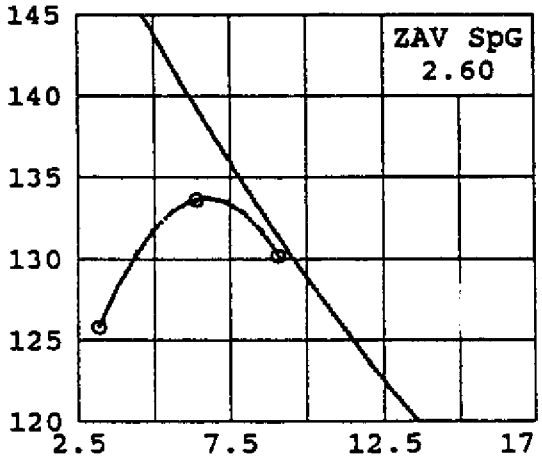
Date:	4-08-1998
Project No.:	3XAC13103
Project:	TRA Warm Waste Pond Remediations
Location 1:	TRA area, east of perimeter fence.
2:	Rubble pile 26.
Remarks 1:	Sampled by R.T. Jones
2:	from rubble stockpile
3:	26 near sewer system.
Material 1:	Pit run gravels, silty
description 2:	gravels with sand.
Elevation or depth:	
Figure No.:	

SPECIMEN DATA

USCS classification: GW-GM AASHTO classification: A-1-a
Natural moisture: Specific gravity: 2.60
Percent retained on 3/4 in sieve: 26.8
Percent passing No. 200 sieve: 6.0
Liquid limit: NV Plastic limit: Plasticity index: NP

TEST DATA AND RESULTS

Type of test: Standard, ASTM D 698-91 Method C

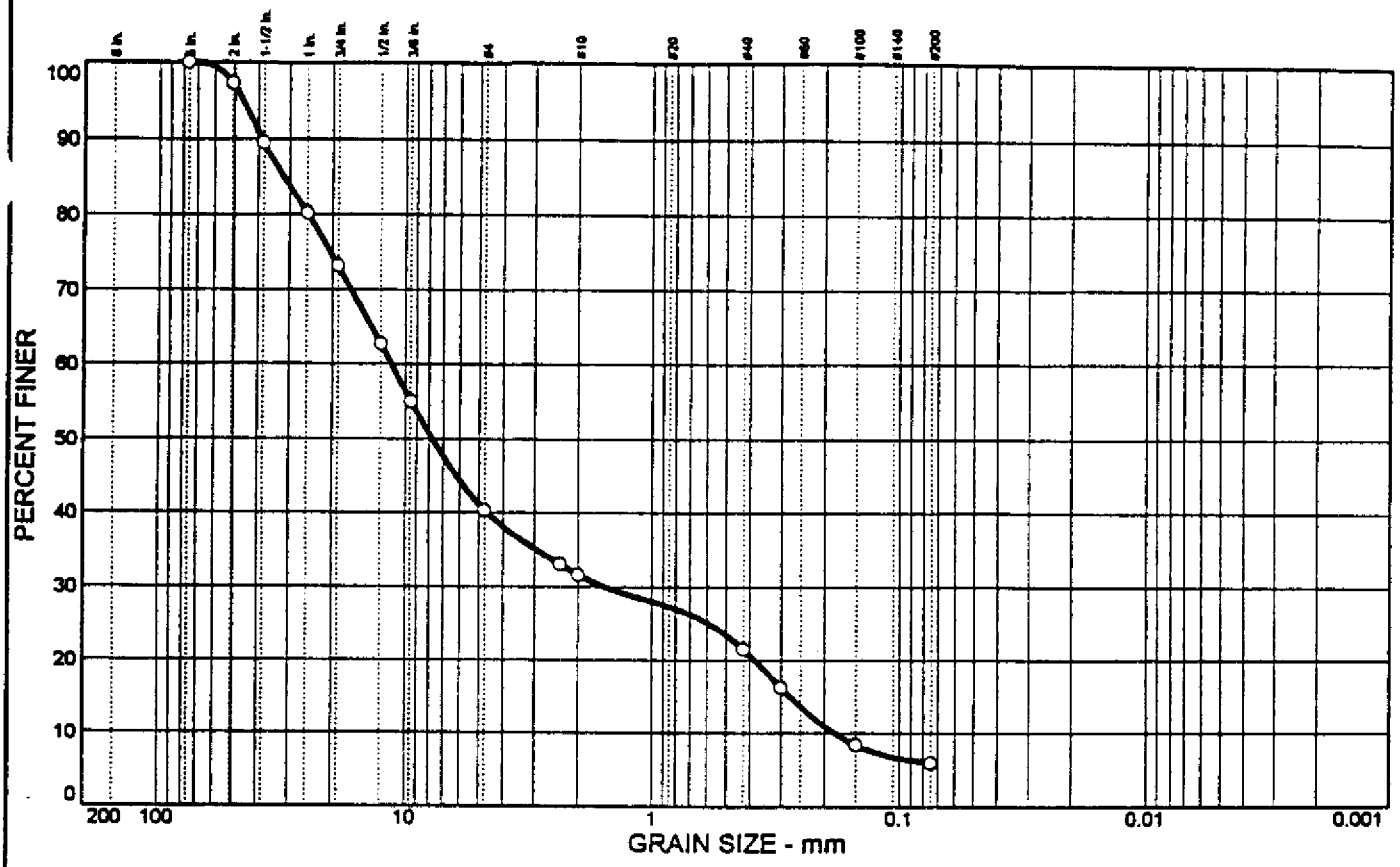


POINT NO.	1	2	3
WM + WS	10950	11370	11365
WM	6530	6530	6530
WW+T #1	447.80	423.90	452.90
WD+T #1	434.10	398.50	415.30
TARE #1	0.00	0.00	0.00
MOIST #1	3.2	6.4	9.1
MOISTURE	3.2	6.4	9.1
DRY DEN	126.0	133.7	130.3

Max dry den= 140.7 pcf, Opt moisture= 4.9 %
Uncorrected Results: Max dry den= 133.8 pcf, Opt moisture= 6.7 %
ASTM D 4718 Correction Data:
Bulk Specific Gravity of Oversize Material = 2.62
Moisture of oversize material = %
ASTM D 4718 Correction Applied to Results Only

INEL MATERIALS LAB

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
O		59.7	34.3			GW-GM	A-1-a	NP	NV

SIEVE inches size	PERCENT FINER O		
3	100.0		
2"	97.3		
1.5	89.5		
1.0	80.2		
0.75	73.2		
0.50	62.7		
0.375	55.0		
	GRAIN SIZE		
D_{60}	11.5		
D_{30}	1.57		
D_{10}	0.183		
	COEFFICIENTS		
C_c	1.17		
C_u	62.94		

SIEVE number size	PERCENT FINER O		
#4	40.3		
#8	33.0		
#10	31.6		
#40	21.5		
#50	16.2		
#100	8.4		
#200	6.0		

SOIL DESCRIPTION

O Pit run gravels. Well-graded gravel with silt and sand

REMARKS:

O Tested to ASTM 421-422 and related standards.

O Location: Stockpile TRA 26 Sewer Plant rubble pile

INEL MATERIALS LAB

Client: Pat Taylor INEEL Environmental

Project: TRA Warm Waste Pond Remediations

Project No.: #XAC13103 Page

Client: Pat Taylor INEEL Environmental
Project: TRA Warm Waste Pond Remediations
Project Number: #XAC13103

Sample Data

Source: TRA Rubble Piles
Sample No.: TRA 26 Pile
Elev. or Depth: Stockpile Sample Length (in./cm.):
Location: Stockpile TRA 26 Sewer Plant rubble pile
Description: Pit run gravels. Well-graded gravel with silt and sand
Liquid Limit: NV Plastic Limit: NP
USCS Classification: GW-GM AASHTO Classification: A-1-a
Testing Remarks: Tested to ASTM 421-422 and related standards.

Mechanical Analysis Data

	Initial
Dry sample and tare=	7450.00
Tare =	0.00
Dry sample weight =	7450.00

Sample split on number 4 sieve
Split sample data:
Sample and tare = 403.60 Tare = .00 Sample weight = 403.60
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
2 inch	205.00	97.3
1.5 inch	785.00	89.5
1.0 inch	1475.00	80.2
0.75 inch	2000.00	73.2
0.50 inch	2780.00	62.7
0.375 inch	3355.00	55.0
# 4	4445.00	40.3
# 8	72.80	33.0
# 10	87.00	31.6
# 40	188.20	21.5
# 50	241.00	16.2
# 100	319.40	8.4
# 200	343.30	6.0

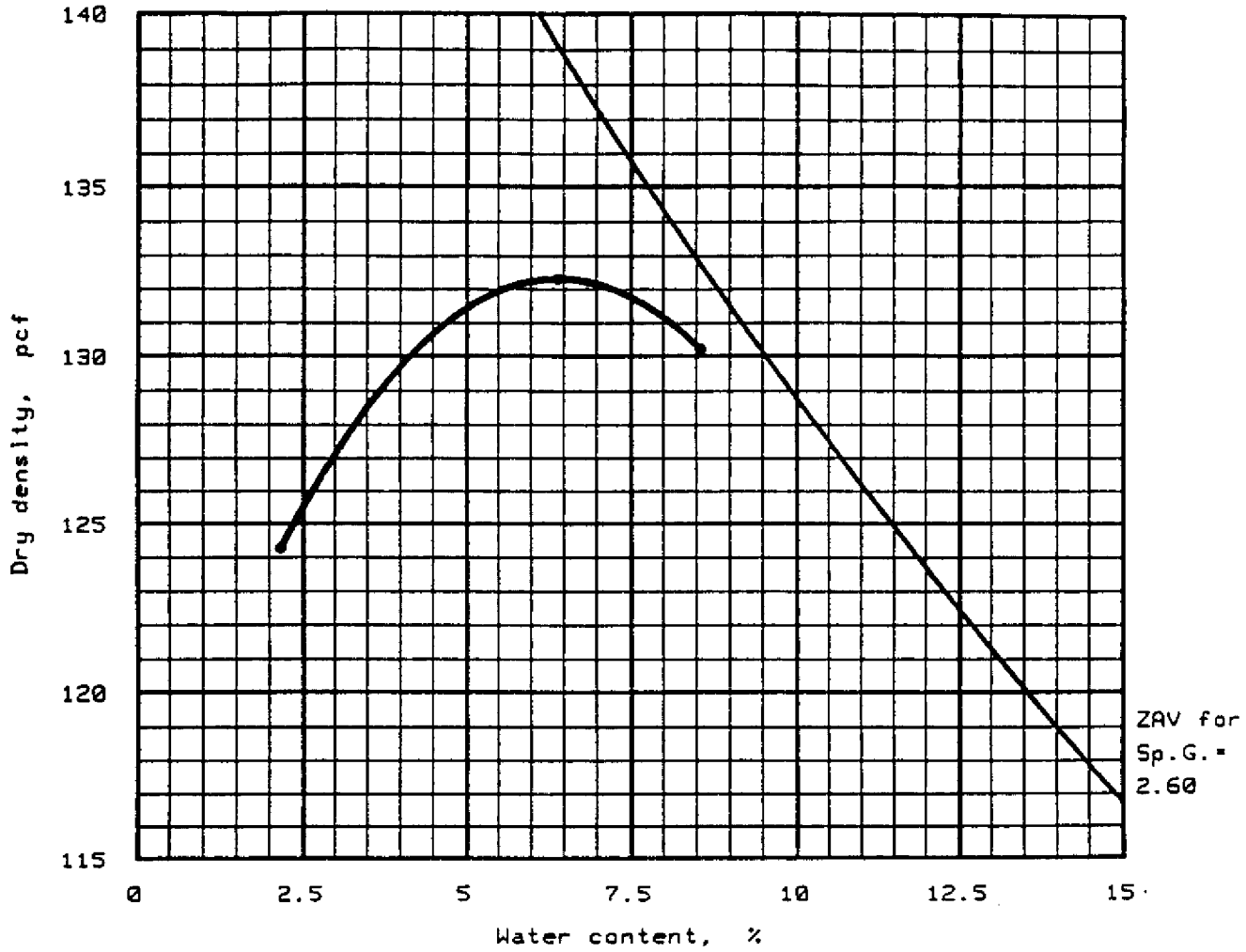
Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = 0.0 % GRAVEL = 59.7 (% coarse = 26.8 % fine = 32.9)
% SAND = 34.3 (% coarse = 8.7 % medium = 10.1 % fine = 15.5)
% FINES = 6.0

D_{85}= 31.69 D_{60}= 11.49 D_{50}= 7.79
D_{30}= 1.57 D_{15}= 0.28 D_{10}= 0.18
C_c= 1.169 C_u= 62.9408

INEL MATERIALS LAB

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Method C, Standard
Oversize correction applied to final results

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in	% < No.200
	USCS	AASHTO						
	GW	A-1-a		2.60	NV	NP	28.4 %	3.6 %

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 139.6 pcf Optimum moisture = 4.6 %	Pir run gravels, Well graded gravels with sand

Project No.: 3XAC13103
Project: TRA Warm Waste Pond Remediations.
Location: TRA area, east of perimeter fence. Rubble pile 25.
Date: 4-08-1998

Remarks:
Sampled from rubble stockpile 25 by R.T Jones.

MOISTURE-DENSITY RELATIONSHIP TEST

INEL MATERIALS LAB

Fig. No. _____

PROJECT DATA

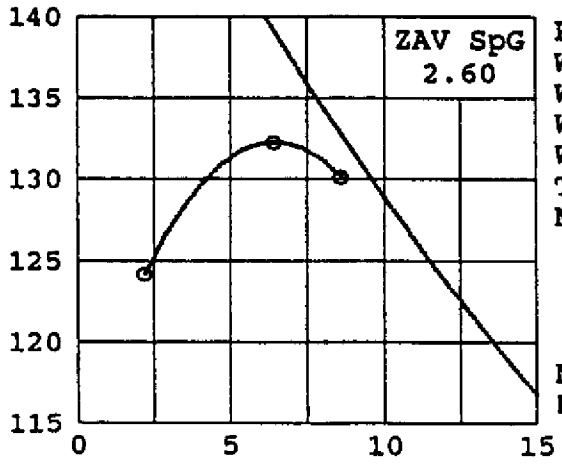
Date:	4-08-1998
Project No.:	3XAC13103
Project:	TRA Warm Waste Pond Remediations.
Location 1:	TRA area, east of perimeter fence.
2:	Rubble pile 25.
Remarks 1:	Sampled from rubble
2:	stockpile 25 by R.T
3:	Jones.
Material 1:	Pir run gravels, Well
description 2:	graded gravels with sand
Elevation or depth:	
Figure No.:	

SPECIMEN DATA

USCS classification: GW AASHTO classification: A-1-a
Natural moisture: Specific gravity: 2.60
Percent retained on 3/4 in sieve: 28.4
Percent passing No. 200 sieve: 3.6
Liquid limit: NV Plastic limit: Plasticity index: NP

TEST DATA AND RESULTS

Type of test: Standard, ASTM D 698-91 Method C

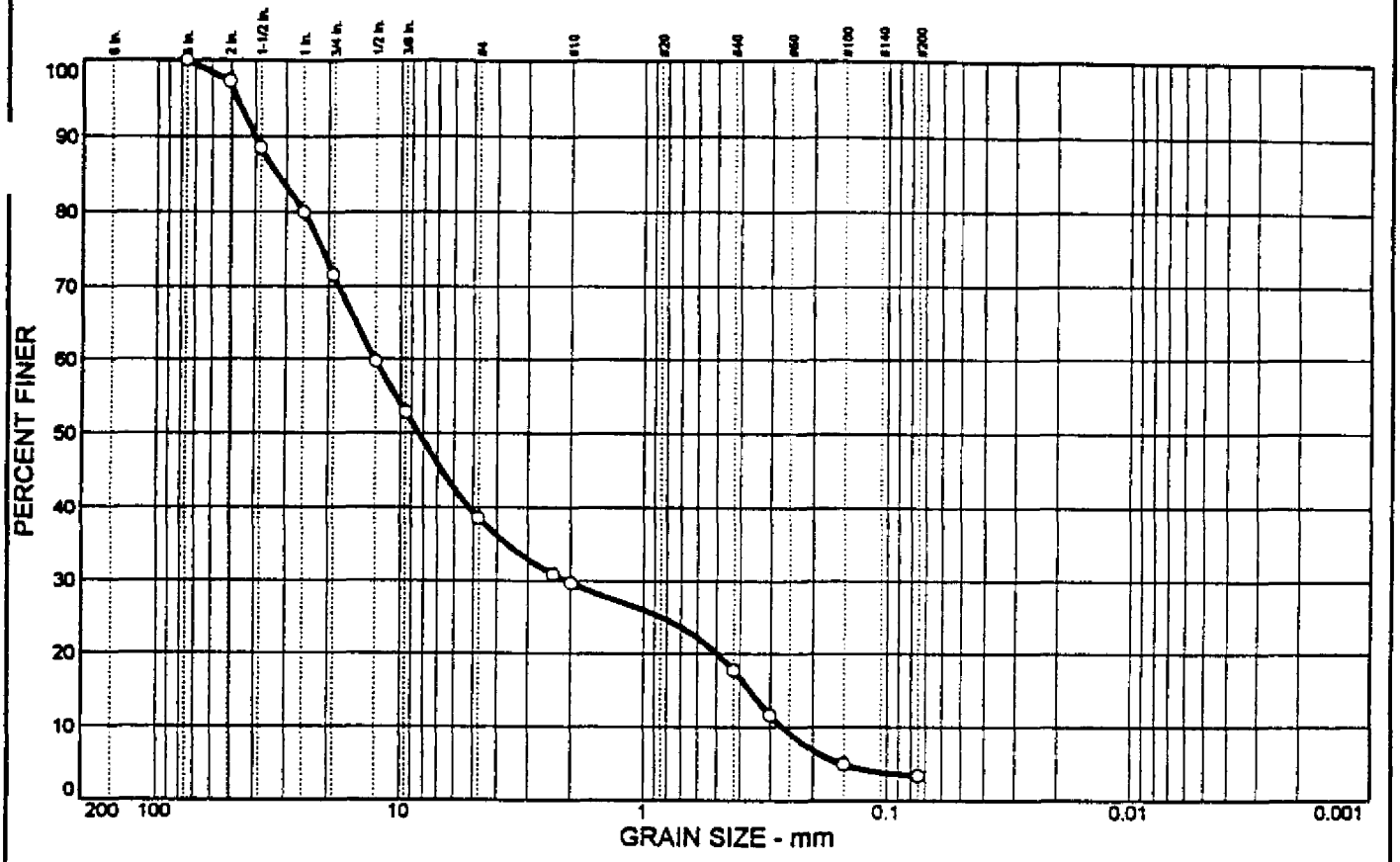


POINT NO.	1	2	3
WM + WS	10850	11320	11340
WM	6530	6530	6530
WW+T #1	433.60	438.70	423.60
WD+T #1	424.40	412.30	390.20
TARE #1	0.00	0.00	0.00
MOIST #1	2.2	6.4	8.6
MOISTURE	2.2	6.4	8.6
DRY DEN	124.3	132.3	130.2

Max dry den= 139.6 pcf, Opt moisture= 4.6 %
Uncorrected Results: Max dry den= 132.3 pcf, Opt moisture= 6.4 %
ASTM D 4718 Correction Data:
Bulk Specific Gravity of Oversize Material = 2.60
Moisture of oversize material = %
ASTM D 4718 Correction Applied to Results Only

INEL MATERIALS LAB

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		61.5	34.9			GW	A-1-a	NP	NV

SIEVE inches size	PERCENT FINER ○		
3"	100.0		
2	97.3		
1.5	88.5		
1.0	80.0		
0.75	71.6		
0.50	59.7		
0.375	52.8		
	GRAIN SIZE		
D_{60}	12.8		
D_{30}	2.09		
D_{10}	0.267		
	COEFFICIENTS		
C_c	1.27		
C_u	48.11		

SIEVE number size	PERCENT FINER ○		
#4	38.5		
#8	30.9		
#10	29.7		
#40	17.7		
#50	11.7		
#100	5.1		
#200	3.6		

SOIL DESCRIPTION

○ Pit run gravels. Well-graded gravel with sand

REMARKS:

○ Tested to ASTM 421-422 and related standards.

○ Location: TRA 25 rubble pile

INEL MATERIALS LAB

Client: Pat Taylor INEEL Environmental

Project: TRA Warm Waste Pond Remediations

Project No.: #XAC13103 Page

Client: Pat Taylor INEEL Environmental
Project: TRA Warm Waste Pond Remediations
Project Number: #XAC13103

Sample Data

Source: TRA Rubble Piles
Sample No.: TRA 25 Pile
Elev. or Depth: Stockpile Sample Length (in./cm.):
Location: TRA 25 rubble pile
Description: Pit run gravels. Well-graded gravel with sand
Liquid Limit: NV Plastic Limit: NP
USCS Classification: GW AASHTO Classification: A-1-a
Testing Remarks: Tested to ASTM 421-422 and related standards.

Mechanical Analysis Data

	Initial
Dry sample and tare=	8021.00
Tare =	0.00
Dry sample weight =	8021.00

Sample split on number 4 sieve
Split sample data:
Sample and tare = 404.00 Tare = .00 Sample weight = 404.00
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

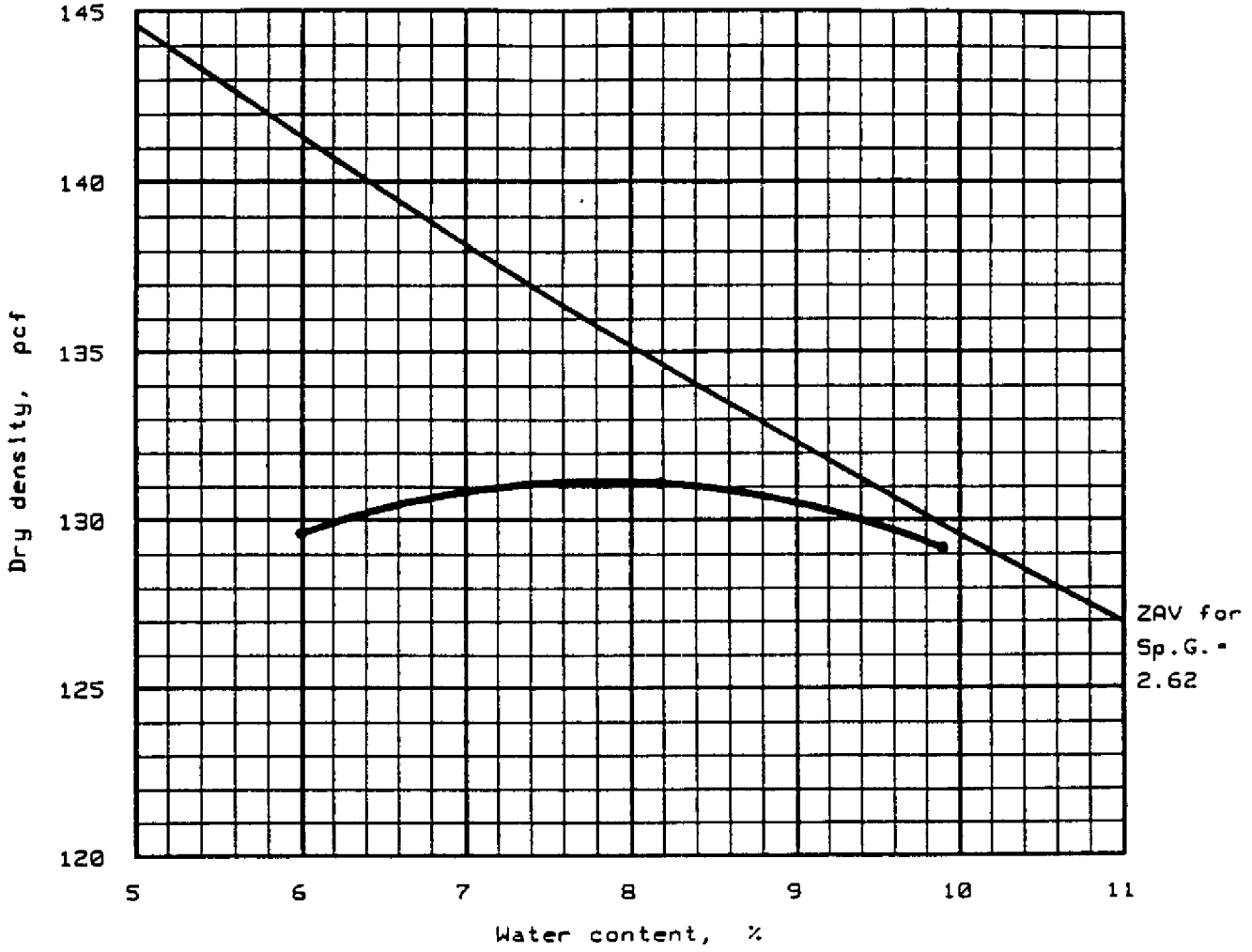
Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
2 inch	215.00	97.3
1.5 inch	920.00	88.5
1.0 inch	1605.00	80.0
0.75 inch	2275.00	71.6
0.50 inch	3235.00	59.7
0.375 inch	3790.00	52.8
# 4	4930.00	38.5
# 8	80.20	30.9
# 10	92.60	29.7
# 40	218.10	17.7
# 50	281.40	11.7
# 100	350.60	5.1
# 200	366.70	3.6

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = 0.0 % GRAVEL = 61.5 (% coarse = 28.4 % fine = 33.1)
% SAND = 34.9 (% coarse = 8.8 % medium = 12.0 % fine = 14.1)
% FINES = 3.6

D_{85}= 32.42 D_{60}= 12.85 D_{50}= 8.43
D_{30}= 2.09 D_{15}= 0.36 D_{10}= 0.27
C_c= 1.2727 C_u= 48.1138

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Method C, Standard
Oversize correction applied to final results

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in	% < No.200
	USCS	AASHTO						
	GC-GM	A-1-b	na %	2.62	18	4	22.9 %	19.0 %

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 137.2 pcf Optimum moisture = 6.0 %	Silty clayey gravels with sand.

Project No.: 3XAC13103
Project: TRA Warm Waste Pond Remediations
Location: TRA East of perimeter fence.

Date: 4-06-1998

Remarks:
Sampled from stockpile TRA 23, by R.T. Jones.

MOISTURE-DENSITY RELATIONSHIP TEST
INEL MATERIALS LAB

Fig. No. _____

MOISTURE-DENSITY TEST DATA — DATA FILE: 191

PROJECT DATA

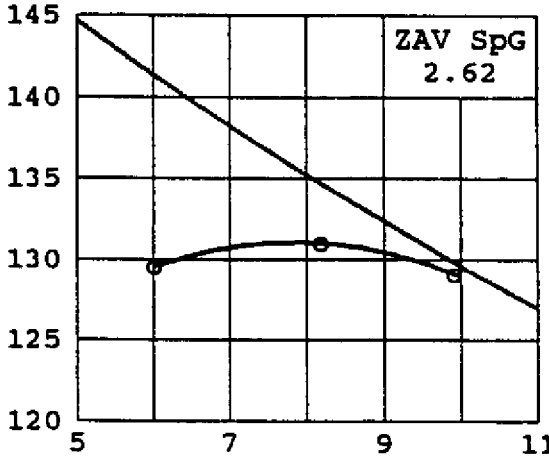
Date: 4-06-1998
Project No.: 3XAC13103
Project: TRA Warm Waste Pond Remediations
Location 1: TRA East of perimeter fence.
2:
Remarks 1: Sampled from stockpile
2: TRA 23, by R.T. Jones.
3:
Material 1: Silty clayey gravels
description 2: with sand.
Elevation or depth:
Figure No.:

SPECIMEN DATA

USCS classification: GC-GM AASHTO classification: A-1-b
Natural moisture: na Specific gravity: 2.62
Percent retained on 3/4 in sieve: 22.9
Percent passing No. 200 sieve: 19.0
Liquid limit: 18 Plastic limit: 14 Plasticity index: 4

TEST DATA AND RESULTS

Type of test: Standard, ASTM D 698-91 Method C

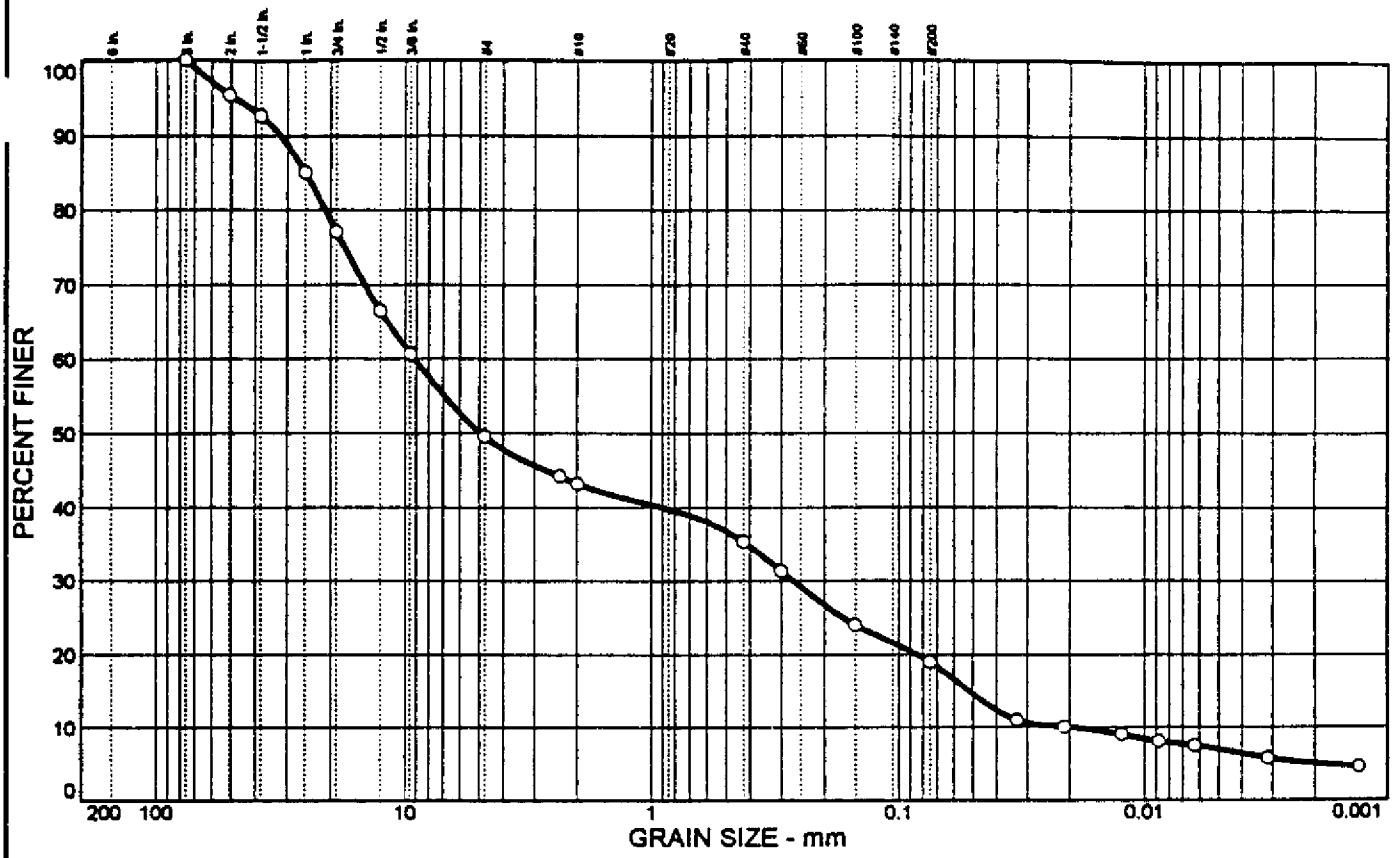


POINT NO.	1	2	3
WM + WS	11205	11360	11355
WM	6530	6530	6530
WW+T #1	201.40	233.10	460.50
WD+T #1	190.00	212.10	425.70
TARE #1	0.00	0.00	0.00
MOIST #1	6.0	9.9	8.2
MOISTURE	6.0	9.9	8.2
DRY DEN	129.6	129.2	131.1

Max dry den= 137.2 pcf, Opt moisture= 6.0 %
Uncorrected Results: Max dry den= 131.2 pcf, Opt moisture= 7.8 %
ASTM D 4718 Correction Data:
Bulk Specific Gravity of Oversize Material = 2.60
Moisture of oversize material = %
ASTM D 4718 Correction Applied to Results Only

INEL MATERIALS LAB

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		50.5	30.5	12.0	7.0	GC-GM	A-1-b	14	18

SIEVE inches size	PERCENT FINER ○		
3"	100.0		
2"	95.4		
1.5	92.7		
1.0	85.1		
0.75	77.1		
0.50	66.5		
0.375	60.7		
	GRAIN SIZE		
D_{60}	9.18		
D_{30}	0.269		
D_{10}	0.0194		
	COEFFICIENTS		
C_c	0.41		
C_u	472.75		

SIEVE number size	PERCENT FINER ○		
#4	49.5		
#8	44.2		
#10	43.2		
#40	35.3		
#50	31.3		
#100	24.0		
#200	19.0		

SOIL DESCRIPTION

○ Silty pit run gravels. Silty clayey gravel with sand

REMARKS:

○ Tested to ASTM D-422, 421 and related standards.

○ Location: Stockpile located east of TRA fence, Pile 23

INEL MATERIALS LAB

Client: Pat Taylor INEEL Environmental

Project: TRA Warm Waste Pond Remediations

Project No.: #XAC13103 Page

Client: Pat Taylor INEEL Environmental
Project: TRA Warm Waste Pond Remediations
Project Number: #XAC13103

Sample Data

Source: TRA Rubble Piles
Sample No.: TRA ETR 23 Pile
Elev. or Depth: Stockpile Sample Length (in./cm.): NA
Location: Stockpile located east of TRA fence, Pile 23
Description: Silty pit run gravels. Silty clayey gravel with sand
Liquid Limit: 18 Plastic Limit: 14
USCS Classification: GC-GM AASHTO Classification: A-1-b
Testing Remarks: Tested to ASTM D-422, 421 and related standards.

Mechanical Analysis Data

	Initial
Dry sample and tare=	7690.00
Tare =	0.00
Dry sample weight =	7690.00

Sample split on number 4 sieve
Split sample data:
Sample and tare = 453.60 Tare = .00 Sample weight = 453.60
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
2 inch	355.00	95.4
1.5 inch	565.00	92.7
1.0 inch	1145.00	85.1
0.75 inch	1765.00	77.1
0.50 inch	2580.00	66.5
0.375 inch	3025.00	60.7
# 4	3880.00	49.5
# 8	48.20	44.2
# 10	57.90	43.2
# 40	130.00	35.3
# 50	167.10	31.3
# 100	233.90	24.0
# 200	279.90	19.0

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 43.2
Weight of hydrometer sample: 75.0
Calculated biased weight= 173.61
Automatic temperature correction
Composite correction at 20 deg C = -3.0

Meniscus correction only= 1.0
Specific gravity of solids= 2.62
Specific gravity correction factor= 1.007
Hydrometer type: 152H

Effective depth L= 16.294964 - 0.164 x Rm

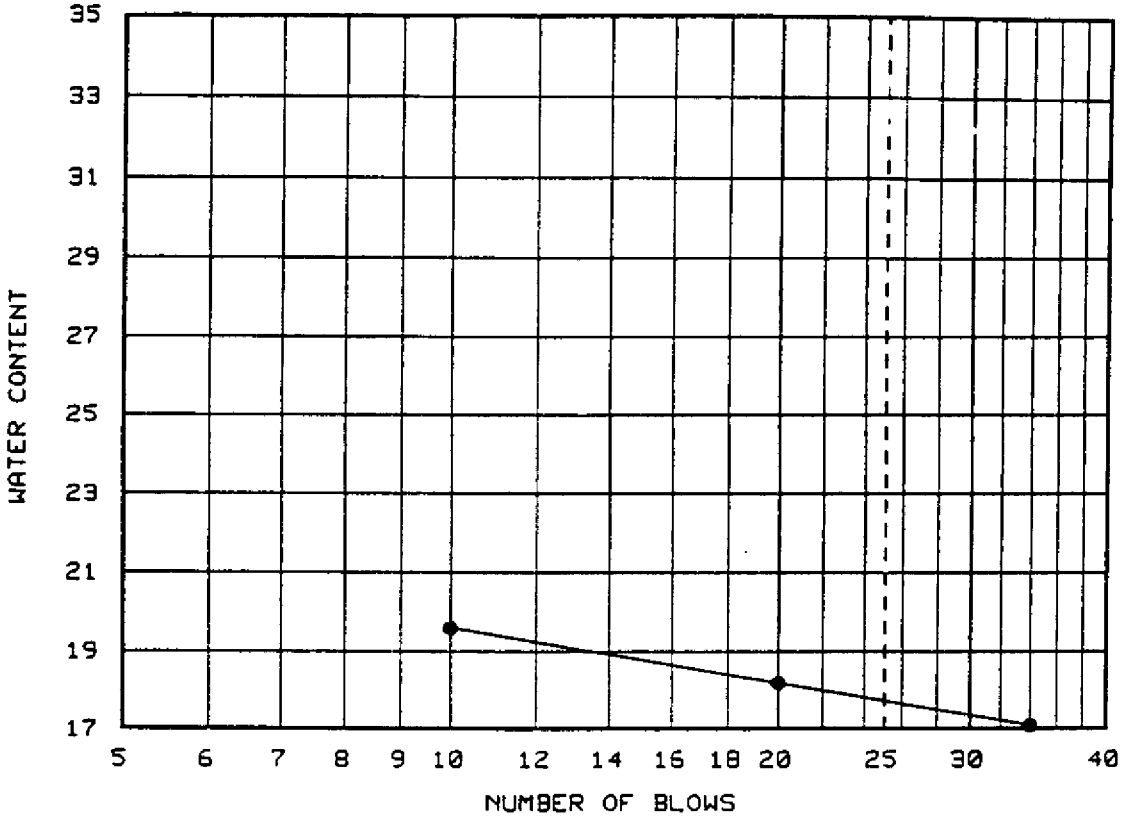
Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
2.00	24.0	21.0	22.0	0.0131	22.0	12.7	0.0330	11.0
5.00	24.0	19.5	20.5	0.0131	20.5	12.9	0.0211	10.1
[illegible].00	24.0	17.5	18.5	0.0131	18.5	13.3	0.0123	9.0
[illegible].00	24.0	16.0	17.0	0.0131	17.0	13.5	0.0088	8.1
60.00	24.0	15.0	16.0	0.0131	16.0	13.7	0.0063	7.5
250.00	24.0	12.0	13.0	0.0131	13.0	14.2	0.0031	5.8
1440.00	24.0	10.0	11.0	0.0131	11.0	14.5	0.0013	4.6

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = 0.0 % GRAVEL = 50.5 (% coarse = 22.9 % fine = 27.6)
% SAND = 30.5 (% coarse = 6.3 % medium = 7.9 % fine = 16.3)
% FINES = 19.0

D_{85}= 25.30 D_{60}= 9.18 D_{50}= 4.95
D_{30}= 0.27

LIQUID AND PLASTIC LIMITS TEST REPORT



	Location + Description	LL	PL	PI	-200	USCS	AASHTO
●	Pile 23	18	14	4	19.0	GM	A-1-b

Project No.: 3XAC13103
Project: TRA Warm Waste Pond Remediations
East of TRA fence.
Client: Craig Reese Parsons Environmental
Location: East of TRA fence line. TRA "rubble" stockpiles. Pile 23.

Date: 04-06-98

LIQUID AND PLASTIC LIMITS TEST REPORT

INEL MATERIALS LAB

Remarks:
Sampled from stockpile TRA 23, near SE corner of TRA area. Sampled by RT Jones.

Fig. No. ———

LIQUID & PLASTIC LIMIT TEST DATA

PROJECT DATA

Project No.:	3XAC13103 Date: 04-06-98
Client:	Craig Reese Parsons Environmental
Project:	TRA Warm Waste Pond Remediations East of TRA fence.
Project location:	East of TRA fence line. TRA "rubble" stockpiles. Pile 23.
Remarks:	Sampled from stockpile TRA 23, near SE corner of TRA area. Sampled by RT Jones.

Figure Number:

TEST DATA - Test number 1

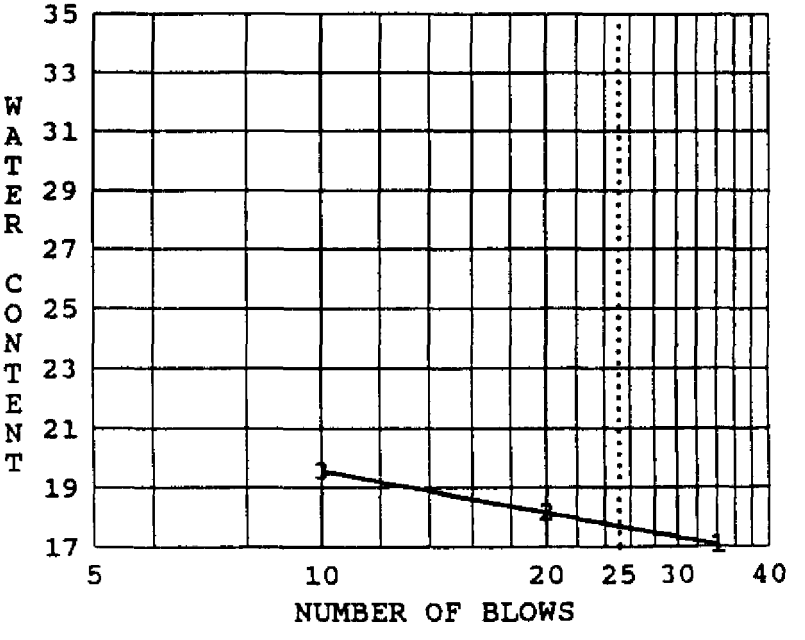
Location and description: Pile 23

LIQUID LIMITS

Run No.	1	2	3	4
[illegible] w+t	20.29	22.23	25.81	
[illegible] d+t	18.96	20.52	23.40	
[illegible] tare	11.18	11.13	11.13	
[illegible] /s	34	20	10	
Moisture	17.1	18.2	19.6	

PLASTIC LIMITS

Run No.	1	2	3
WT w+t	7.30	7.86	6.19
WT d+t	6.93	7.40	5.96
WT tare	4.35	4.34	4.33
Moisture	14.3	15.0	14.1



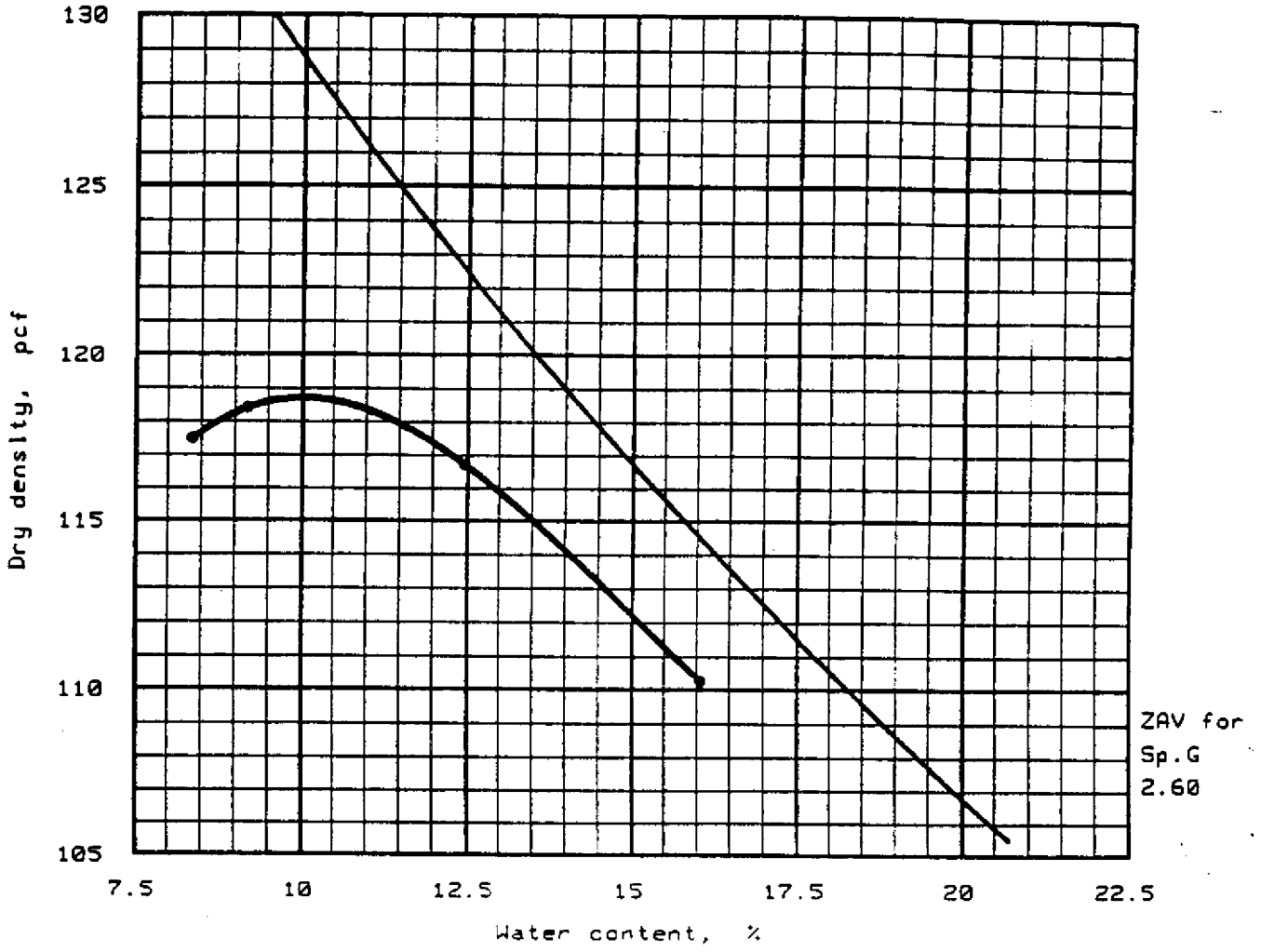
Liquid Limit = 18
Plastic Limit = 14
Plasticity Index = 4

CLASSIFICATION DATA

%-4 = 49.5 %-10 = 43.2 %-40 = 35.3 %-200 = 19.0
Uniformity Coefficient = Curvature Coefficient =
LL = 18 PL = 14 PI = 4 LL (oven dry) =
ASTM = GM, Silty gravel with sand
AASHTO = A-1-b

INEL MATERIALS LAB

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Method A, Standard
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	SC-SM	A-4(0)		2.60	19	5	22.7 %	42.6 %

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 118.7 pcf Optimum moisture = 10.0 %	118.7 pcf 10.0 %	Silty, clayey sand with gravels.

Project No.: 3XAC13103
Project: TRA Warm Waste Pond Remediations.
Location: TRA area, east of TRA perimeter fence.
TRA 10 rubble pile.
Date: 4-08-1998

Remarks:
Sampled from the TRA rubble pile 10 by R.T. Jones.

MOISTURE-DENSITY RELATIONSHIP TEST

INEL MATERIALS LAB

Fig. No. _____

MOISTURE-DENSITY TEST DATA — DATA FILE: 194

PROJECT DATA

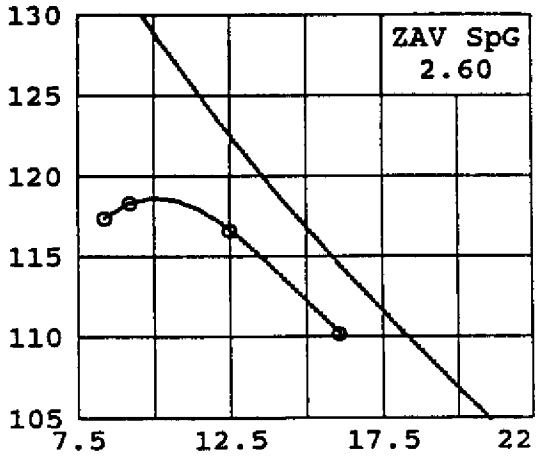
Date:	4-08-1998
Project No.:	3XAC13103
Project:	TRA Warm Waste Pond Remediations.
Location 1:	TRA area, east of TRA perimeter fence.
2:	TRA 10 rubble pile.
Remarks 1:	Sampled from the TRA
2:	rubble pile 10 by R.T.
3:	Jones.
Material 1:	Silty, clayey sand with
description 2:	gravels.
Elevation or depth:	
Figure No.:	

SPECIMEN DATA

USCS classification: SC-SM AASHTO classification: A-4(0)
Natural moisture: Specific gravity: 2.60
Percent retained on No.4 sieve: 22.7
Percent passing No. 200 sieve: 42.6
Liquid limit: 19 Plastic limit: 14 Plasticity index: 5

TEST DATA AND RESULTS

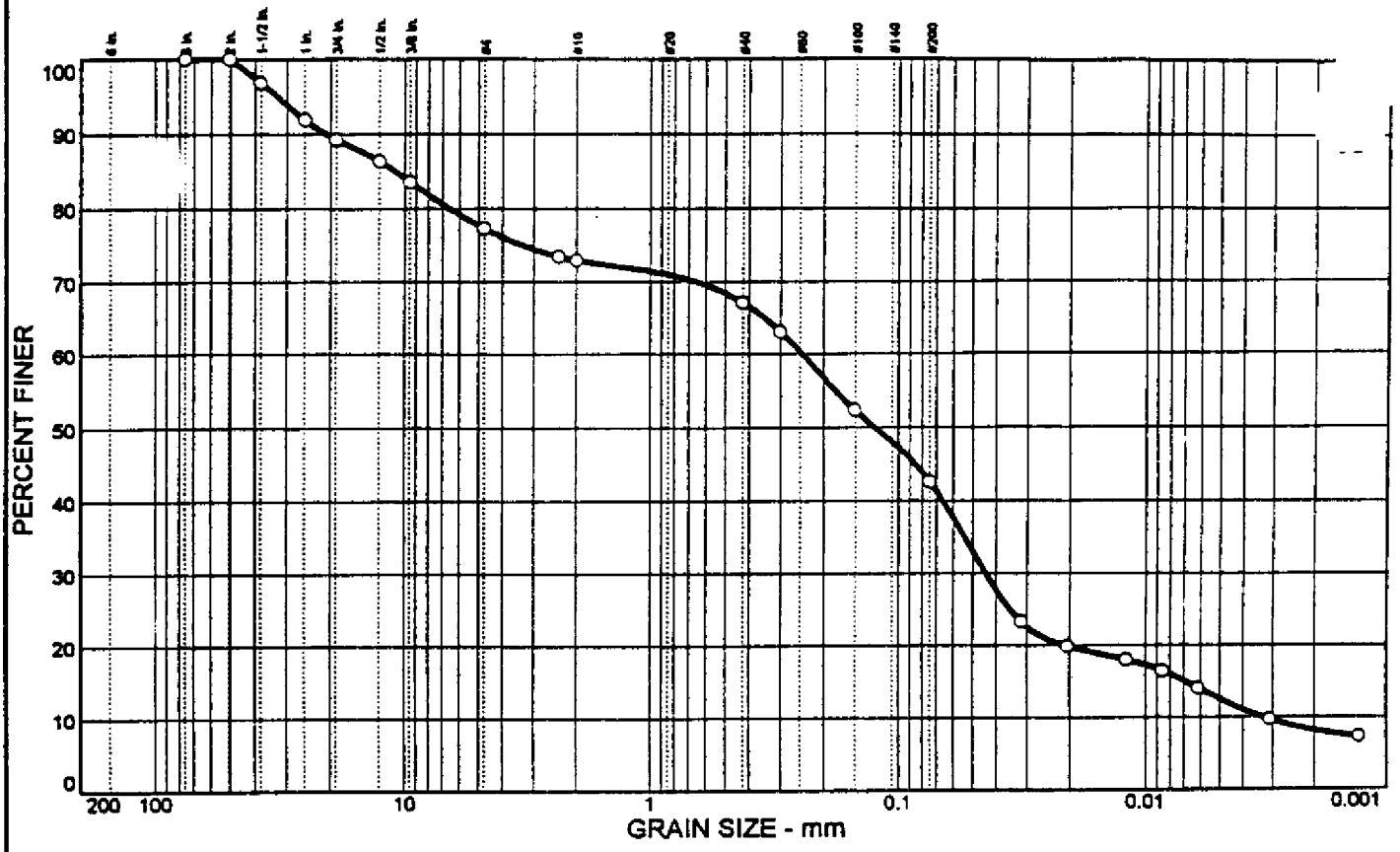
Type of test: Standard, ASTM D 698-91 Method A



POINT NO.	1	2	3	4
WM + WS	6200	6230	6180	6170
WM	4245	4245	4245	4245
WW+T #1	405.60	427.40	454.90	390.30
WD+T #1	371.50	380.00	392.00	360.20
TARE #1	0.00	0.00	0.00	0.00
MOIST #1	9.2	12.5	16.0	8.4
MOISTURE	9.2	12.5	16.0	8.4
DRY DEN	118.4	116.7	110.3	117.5

Max dry den= 118.7 pcf, Opt moisture= 10.0 %
Oversize Correction Not Applied

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL
O		22.7	34.7	30.0	12.6	SC-SM	A-4(0)	14

SIEVE inches size	PERCENT FINER O		
3"	100.0		
2"	100.0		
1.5	96.9		
1.0	91.9		
0.75	89.3		
0.50	86.4		
0.375	83.6		
	GRAIN SIZE		
D_{60}	0.244		
D_{30}	0.0442		
D_{10}	0.0033		
	COEFFICIENTS		
C_c	2.43		
C_u	74.26		

SIEVE number size	PERCENT FINER O		
#4	77.3		
#8	73.5		
#10	73.0		
#40	67.1		
#50	63.1		
#100	52.3		
#200	42.6		

SOIL DESCRIPTION

O Silty, clayey sand with gravel.

REMARKS:

O Tested to ASTM D-421-422 and related standards.

O Location: TRA 10 rubble pile

INEL MATERIALS LAB

Client: Pat Taylor INEEL Environmental

Project: TRA Warm Waste Pond Remediations

Project No.: #XAC13103 Page

Client: Pat Taylor INEEL Environmental
Project: TRA Warm Waste Pond Remediations
Project Number: #XAC13103

Sample Data

Source: TRA Rubble Piles
Sample No.: TRA 10 Pile
Elev. or Depth: Stockpile Sample Length (in./cm.):
Location: TRA 10 rubble pile
Description: Silty, clayey sand with gravel.
Liquid Limit: 19 Plastic Limit: 14
USCS Classification: SC-SM AASHTO Classification: A-4(0)
Testing Remarks: Tested to ASTM D-421-422 and related standards.

Mechanical Analysis Data

	Initial
Dry sample and tare=	5777.00
Tare =	0.00
Dry sample weight =	5777.00

Sample split on number 4 sieve
Split sample data:
Sample and tare = 499.80 Tare = .00 Sample weight = 499.80
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
inch	0.00	100.0
inch	0.00	100.0
inch	180.00	96.9
1.0 inch	470.00	91.9
0.75 inch	620.00	89.3
0.50 inch	785.00	86.4
0.375 inch	945.00	83.6
# 4	1310.00	77.3
# 8	24.50	73.5
# 10	27.90	73.0
# 40	65.80	67.1
# 50	91.80	63.1
# 100	161.70	52.3
# 200	224.50	42.6

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 73.0
Weight of hydrometer sample: 75.0
Calculated biased weight= 102.74
Automatic temperature correction
Composite correction at 20 deg C = -3.0

Meniscus correction only= 1.0
Specific gravity of solids= 2.65
Specific gravity correction factor= 1.000
Hydrometer type: 152H

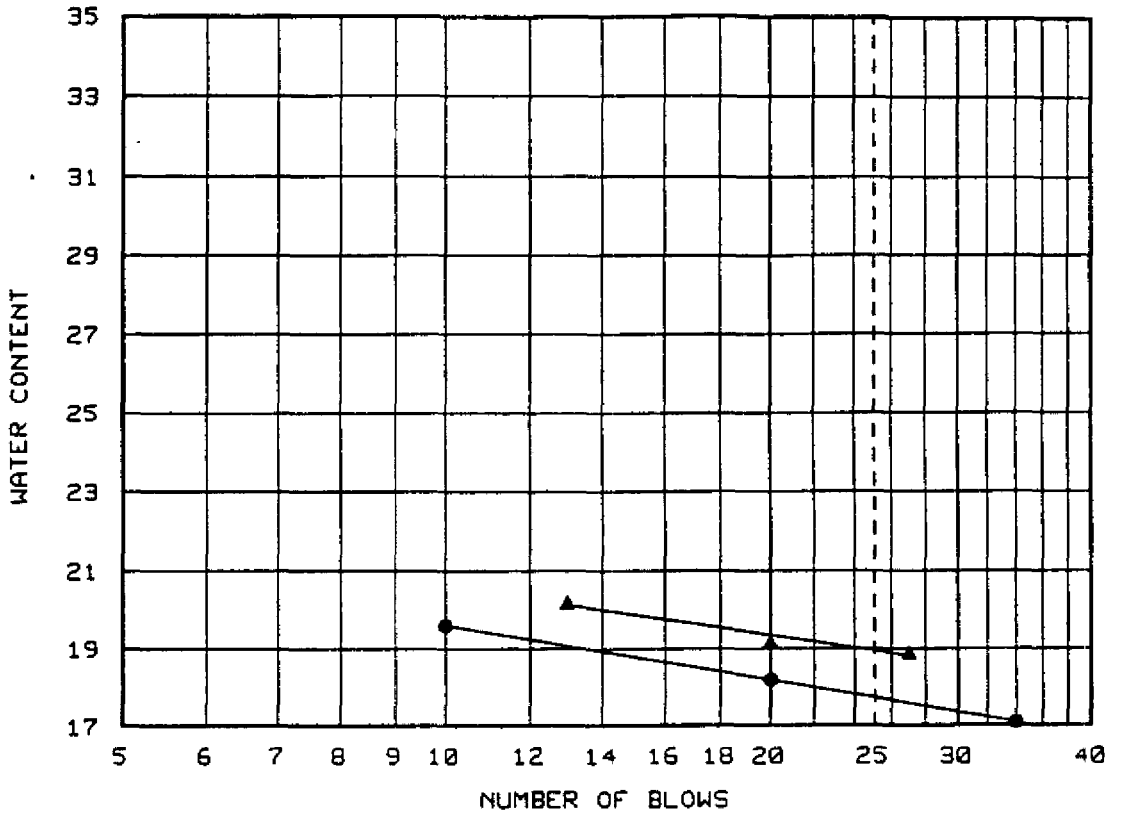
Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
2.00	24.0	26.0	27.0	0.0130	27.0	11.9	0.0317	23.3
5.00	24.0	22.5	23.5	0.0130	23.5	12.4	0.0205	19.9
15.00	24.0	20.5	21.5	0.0130	21.5	12.8	0.0120	18.0
30.00	24.0	19.0	20.0	0.0130	20.0	13.0	0.0086	16.5
60.00	24.0	16.5	17.5	0.0130	17.5	13.4	0.0061	14.[illegible]
250.00	24.0	12.0	13.0	0.0130	13.0	14.2	0.0031	9.7
1440.00	24.0	9.5	10.5	0.0130	10.5	14.6	0.0013	7.3

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = 0.0 % GRAVEL = 22.7 (% coarse = 10.7 % fine = 12.0)
% SAND = 34.7 (% coarse = 4.3 % medium = 5.9 % fine = 24.5)
% SILT = 30.0 % CLAY = 12.6

D_{85}= 10.93 D_{60}= 0.24 D_{50}= 0.13
D_{30}= 0.04 D_{15}= 0.01 D_{10}= 0.00
C_C= 2.4306 C_u= 74.2591

LIQUID AND PLASTIC LIMITS TEST REPORT



	Location + Description	LL	PL	PI	-200	USCS	AASHTO
●	Pile 23	18	14	4	19.0	GM	A-1-b
▲	TRA rubble pile 10	19	14	5	42.6	SC-SM	A-4(0)

Project No.: 3XAC13103
Project: TRA Warm Waste Pond Remediations
East of TRA fence.
Client: Craig Reese Parsons Environmental
Location: East of TRA fence line. TRA "rubble" stockpiles. Pile 23 and pile 10.

Date: 04-06-98

Remarks:
Sampled from stockpile TRA 23&10 near E. fence of TRA area. Sampled by RT Jones.

LIQUID AND PLASTIC LIMITS TEST REPORT

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Fig. No. _____

LIQUID & PLASTIC LIMIT TEST DATA

PROJECT DATA

Project No.:	3XAC13103 Date: 04-06-98
Client:	Craig Reese Parsons Environmental
Project:	TRA Warm Waste Pond Remediations East of TRA fence.
Project location:	East of TRA fence line. TRA "rubble" stockpiles. Pile 23 and pile 10.
Remarks:	Sampled from stockpile TRA 23&10 near E. fence of TRA area. Sampled by RT Jones.

Figure Number:

TEST DATA - Test number 2

Location and description: TRA rubble pile 10

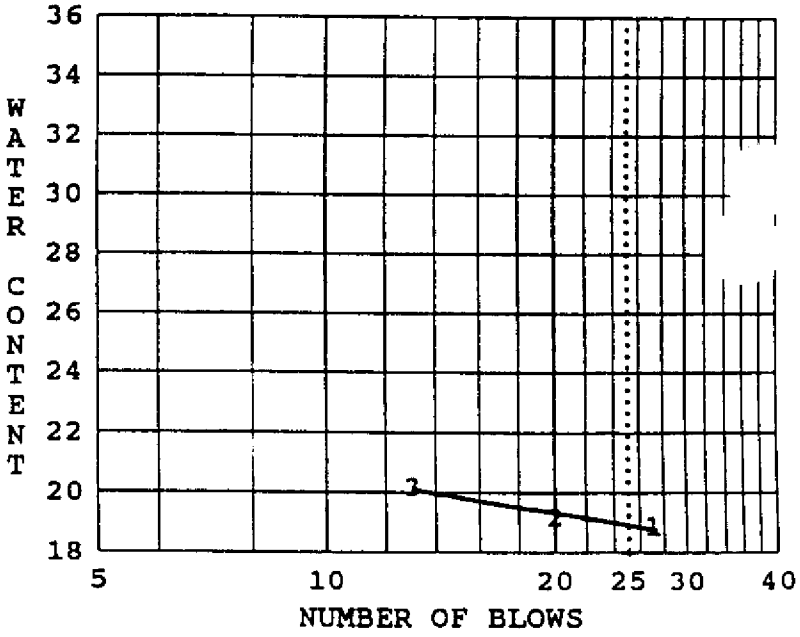
LIQUID LIMITS

Run No.	1	2	3	4
WT w+t	23.00	24.46	26.98	
WT d+t	21.11	22.31	24.32	
WT tare	11.12	11.10	11.15	
# Blows	27	20	13	
Moisture	18.9	19.2	20.2	

PLASTIC LIMITS

Run No.	1	2	3
WT w+t	7.00	7.63	8.18
WT d+t	6.67	7.23	7.68
WT tare	4.32	4.37	4.41
Moisture	14.0	14.0	15.3

Liquid Limit = 19
Plastic Limit = 14
Plasticity Index = 5



CLASSIFICATION DATA

%-4 = 77.3 %-10 = 73.0 %-40 = 67.1 %-200 = 42.6
Uniformity Coefficient = 74.26 Curvature Coefficient = 2.43
LL = 19 PL = 14 PI = 5 LL (oven dry) =
ASTM = SC-SM, Silty, clayey sand with gravel
AASHTO = A-4(0)

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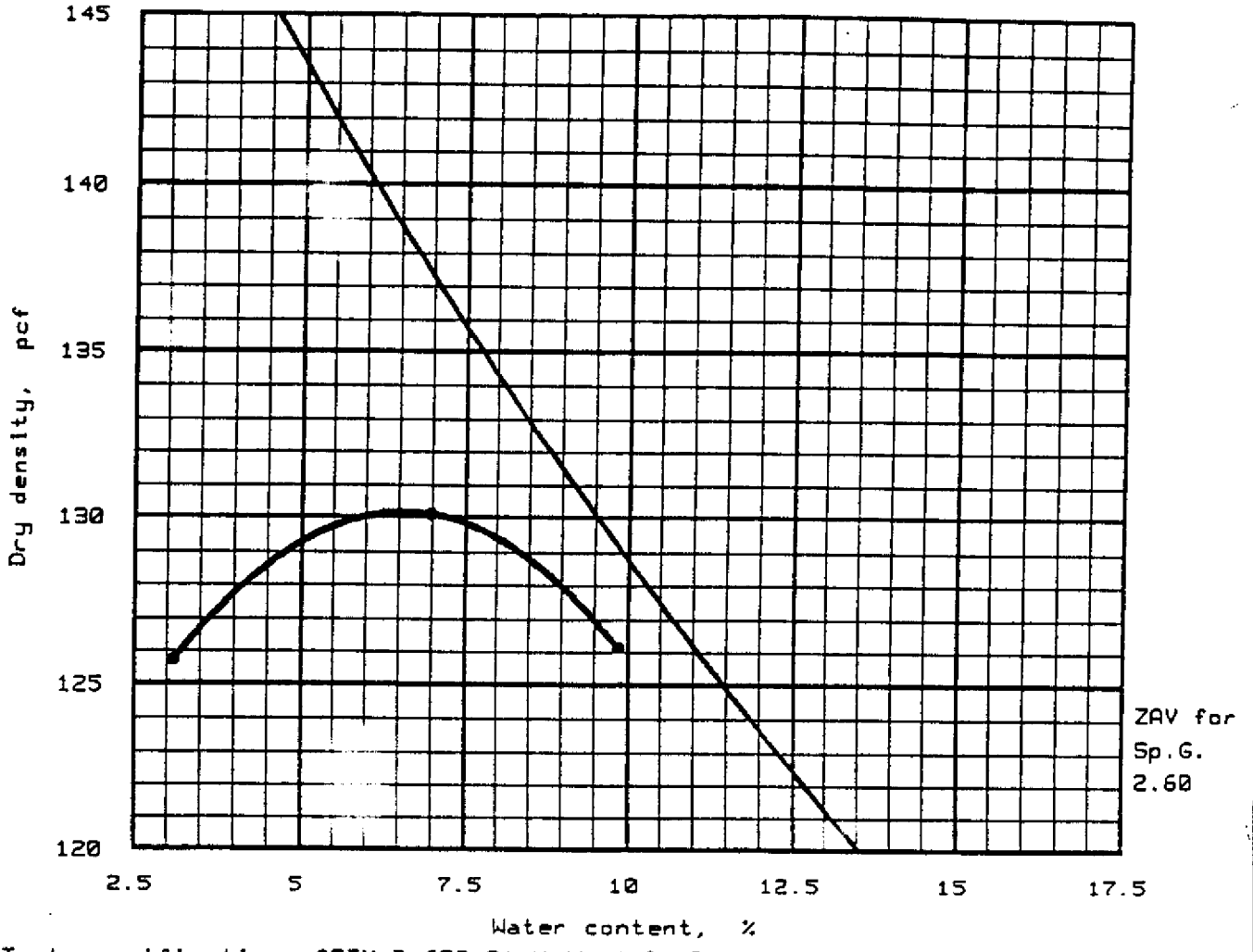
LIQUID AND PLASTIC LIMITS TEST PROJECT SUMMARY

ject No.: 3XAC13103 Date: 4-08-1998
ct: TRA Warm Waste Pond Remediations
East of TRA fence.
Project Location: East of TRA fence line. TRA "rubble" stockpiles. Pile 23 and pile 10.

SAMPLE LOCATION/DESCRIPTION	LL	PL	PI	CLASSIFICATIONS ASTM	AASHTO
TEST FILE NO. 125:					
1: Pile 23	18	14	3	GM	A-1-b
2: TRA rubble pile 10	19	14	5	SC-SM	A-4(0)

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Method C, Standard
Oversize correction applied to final results

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in	% < No.200
	USCS	AASHTO						
	GP	A-1-a		2.60	NV	NP	15.1 %	4.5 %

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 134.2 pcf Optimum moisture = 5.6 %	Poorly graded gravel with sand.

Project No.: 3XAC13103
Project: TRA Warm Waste Pond Remediation
Location: Sampled from the CFA gravel located 1/4 mile north of CFA.
Date: 5-06-1996

Remarks:
Sampled by RT Jones for the TRA pond remediation projects.

MOISTURE-DENSITY RELATIONSHIP TEST
INEL MATERIALS LAB

Fig. No. _____

MOISTURE-DENSITY TEST DATA — DATA FILE: 195

PROJECT DATA

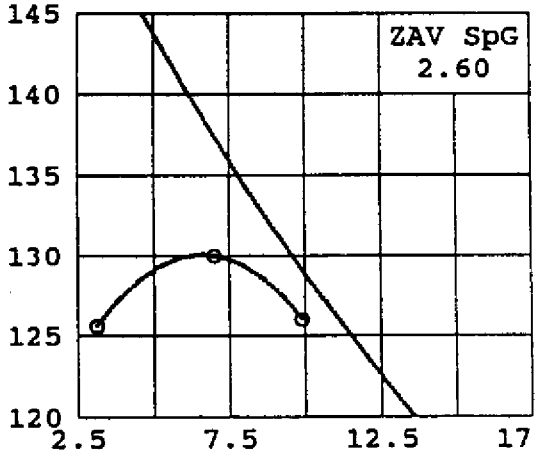
Da.	5-06-1998
Project No.:	3XAC13103
Project:	TRA Warm Waste Pond Remediations
Location 1:	Sampled from the CFA gravel pit
2:	located 1/4 mile north of CFA.
Remarks 1:	Sampled by RT Jones for
2:	the TRA pond remediation
3:	projects.
Material 1:	Poorly graded gravel
description 2:	with sand.
Elevation or depth:	
Figure No.:	

SPECIMEN DATA

USCS classification: GP AASHTO classification: A-1-a
Natural moisture: Specific gravity: 2.60
Percent retained on 3/4 in sieve: 15.1
Percent passing No. 200 sieve: 4.5
Liquid limit: NV Plastic limit: Plasticity index: NP

TEST DATA AND RESULTS

Ty of test: Standard, ASTM D 698-91 Method C



POINT NO.	1	2	3
WM + WS	10940	11265	11245
WM	6530	6530	6530
WW+T #1	505.20	476.80	468.70
WD+T #1	490.00	445.70	426.60
TARE #1	0.00	0.00	0.00
MOIST #1	3.1	7.0	9.9
MOISTURE	3.1	7.0	9.9
DRY DEN	125.7	130.1	126.1

Max dry den= 134.2 pcf, Opt moisture= 5.6 %
Uncorrected Results: Max dry den= 130.2 pcf, Opt moisture= 6.6 %

ASTM D 4718 Correction Data:
Bulk Specific Gravity of Oversize Material = 2.60
Moisture of oversize material = %
ASTM D 4718 Correction Applied to Results Only

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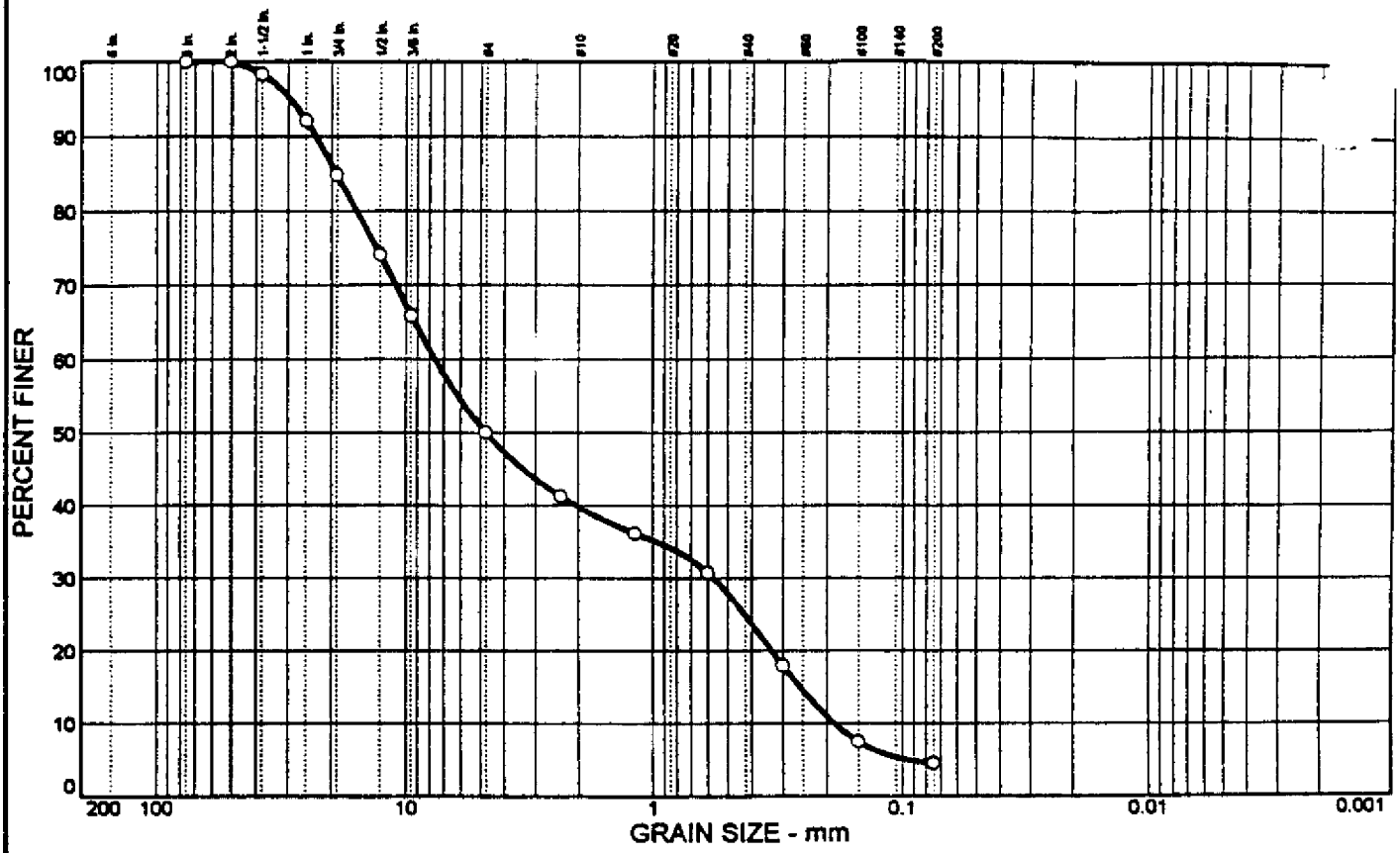
PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL
O		50.0	45.5			GP	A-1-a	

SIEVE inches size	PERCENT FINER O		
3"	100.0		
2"	100.0		
1.5"	98.3		
1.0"	92.1		
0.75"	84.9		
0.50"	74.1		
0.375"	65.9		

GRAIN SIZE			
D_{60}	7.61		
D_{30}	0.571		
D_{10}	0.187		
COEFFICIENTS			
C_c	0.23		
C_u	40.71		

SIEVE number size	PERCENT FINER O		
#4	50.0		
#8	41.2		
#16	36.1		
#30	30.7		
#50	17.9		
#100	7.5		
#200	4.5		

SOIL DESCRIPTION

O sandy gravels. Poorly graded gravel with sand

REMARKS:

O Sampled by RT Jones from the CFA gravel pit.

O Location: CFA pit located 1/4 mile north of CFA area.

INEL MATERIALS LAB

Client: Pat Taylor INEEL Environmental

Project: TRA Warm Waste Pond Remediations

Project No.: #XAC13103 Page

Client: Pat Taylor INEEL Environmental
Project: TRA Warm Waste Pond Remediations
Project Number: #XAC13103

Sample Data

Source:
Sample No.: #2 CFA Pit gravels
Elev. or Depth: Stockpile Sample Length (in./cm.):
Location: CFA pit located 1/4 mile north of CFA area.
Description: sandy gravels. Poorly graded gravel with sand
Liquid Limit: Plastic Limit:
USCS Classification: GP AASHTO Classification: A-1-a
Testing Remarks: Sampled by RT Jones from the CFA gravel pit.

Mechanical Analysis Data

	Initial
Dry sample and tare=	7050.00
Tare =	0.00
Dry sample weight =	7050.00

Sample split on number 4 sieve
Split sample data:
Sample and tare = 433.50 Tare = .00 Sample weight = 433.50
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

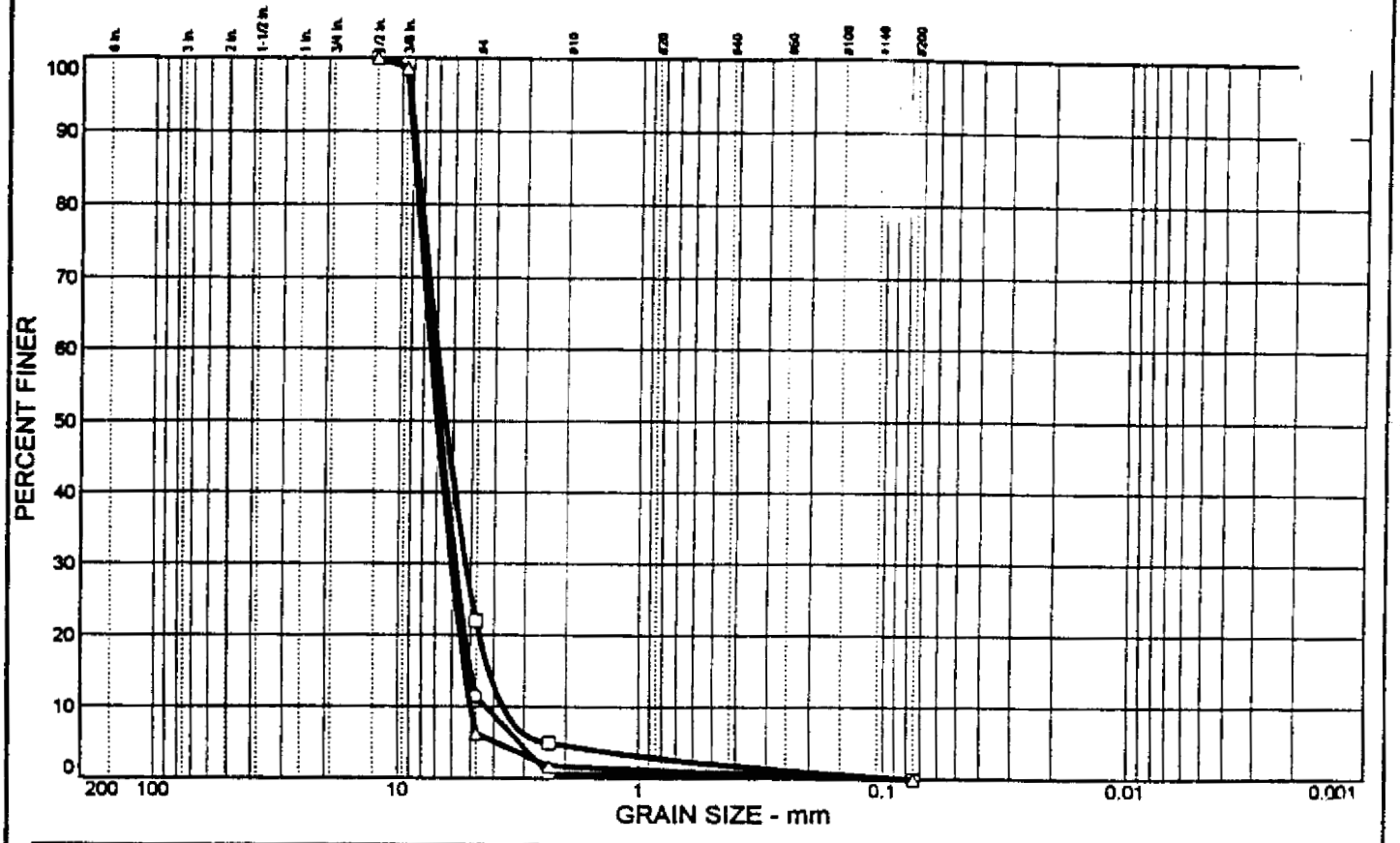
Sieve	Cumul. Wt. retained	Percent finer
inch	0.00	100.0
ch	0.00	100.0
inch	120.00	98.3
1.0 inch	560.00	92.1
0.75 inch	1065.00	84.9
0.50 inch	1825.00	74.1
0.375 inch	2405.00	65.9
# 4	3525.00	50.0
# 8	76.50	41.2
# 16	120.50	36.1
# 30	167.30	30.7
# 50	278.50	17.9
# 100	368.60	7.5
# 200	394.80	4.5

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = 0.0 % GRAVEL = 50.0 (% coarse = 15.1 % fine = 34.9)
% SAND = 45.5 (% coarse = 10.2 % medium = 14.9 % fine = 20.4)
% FINES = 4.5

D_{85}= 19.12 D_{60}= 7.61 D_{50}= 4.75
D_{30}= 0.57 D_{15}= 0.26 D_{10}= 0.19
0.2288 C_u= 40.706

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	
○		88.6	11.4			GP	A-1-a	NP	
□		78.0	22.0			GP	A-1-a	NP	
△		93.7	6.3			GP	A-1-a	NP	NV

SIEVE inches size	PERCENT FINER ○	□	△
1/2	100.0	100.0	100.0
3/8	98.9	99.3	98.7
	GRAIN SIZE		
D_{60}	7.35	7.02	7.49
D_{30}	5.81	5.27	6.05
D_{10}	4.33	3.68	4.99
	COEFFICIENTS		
C_c	1.06	1.08	0.98
C_u	1.69	1.91	1.50

SIEVE number size	PERCENT FINER ○	□	△
#4	11.4	22.0	6.3
#8	0.7	5.0	1.8
#200	0.0	0.0	0.0

SOIL DESCRIPTION

○ State chip pile. Poorly graded gravel

□ State chip pile. Poorly graded gravel with sand

△ State chip pile. Poorly graded gravel

REMARKS:

○ Sampled from small stockpiles in BN-127-S pit. Estimated quantity, 800-1,000 cu.yds.

□ Sampled from small stockpile in pit BN-33-S. Estimated quantity, 100-150 cu.yds., max.

△ Sampled from large chip stockpile in pit BU-26, located along hwy. 26, Butte Co. Estimated quantity of 700 cu.yds.

○ Location: State pit along New Sweden rd., Idaho Falls.

□ Location: Sampled from the state pit 1 mile north of Ucon.

△ Location: Sampled from state pit BU-26, near hwy 26.

INEL MATERIALS LAB

Client: Pat Taylor INEEL Environmental

Project: TRA Warm Waste Pond Remediations

Project No.: #XAC13103 Page

Client: Pat Taylor INEEL Environmental
Project: TRA Warm Waste Pond Remediations
Project Number: #XAC13103

Sample Data

Source:
Sample No.: #1 State Pit BN-127-S
Elev. or Depth: Stockpile Sample Length (in./cm.):
Location: State pit along New Sweden rd., Idaho Falls.
Description: State chip pile. Poorly graded gravel
Liquid Limit: NV Plastic Limit: NP
USCS Classification: GP AASHTO Classification: A-1-a
Testing Remarks: Sampled from small stockpiles in BN-127-S pit. Estimated quantity, 800-1,000 cu.yds.

Mechanical Analysis Data

	Initial
Dry sample and tare=	866.30
Tare =	0.00
Dry sample weight =	866.30

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
1/2 inch	0.00	100.0
3/8 inch	10.00	98.9
4	767.50	11.4
8	859.90	0.7
00	866.30	0.0

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = 0.0 % GRAVEL = 88.6 (% coarse = 0.0 % fine = 88.6)
% SAND = 11.4 (% coarse = 10.7 % medium = 0.3 % fine = 0.4)

D_{85}= 8.70 D_{60}= 7.35 D_{50}= 6.83
D_{30}= 5.81 D_{15}= 4.98 D_{10}= 4.33
C_c= 1.0617 C_u= 1.6946

Client: Pat Taylor INEEL Environmental
Project: TRA Warm Waste Pond Remediations
Project Number: #XAC13103

Sample Data

Source:
Sample No.: #2 State pit BN-33-S
Elev. or Depth: Stockpile **Sample Length (in./cm.):**
Location: Sampled from the state pit 1 mile north of Ucon.
Description: State chip pile. Poorly graded gravel with sand
Liquid Limit: NV **Plastic Limit:** NP
USCS Classification: GP **AASHTO Classification:** A-1-a
Testing Remarks: Sampled from small stockpile in pit BN-33-S. Estimated quantity, 100-150 cu.yds., max.

Mechanical Analysis Data

	Initial
Dry sample and tare=	796.00
Tare =	0.00
Dry sample weight =	796.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
1/2 inch	0.00	100.0
3/8 inch	5.50	99.3
# 4	621.10	22.0
# 8	756.20	5.0
# 200	796.00	0.0

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = 0.0 % GRAVEL = 78.0 (% coarse = 0.0 % fine = 78.0)
% SAND = 22.0 (% coarse = 17.4 % medium = 2.7 % fine = 1.9)

D_{85}= 8.55 D_{60}= 7.02 D_{50}= 6.44
D_{30}= 5.27 D_{15}= 4.20 D_{10}= 3.68
C_c= 1.0761 C_u= 1.9075

Client: Pat Taylor INEEL Environmental
Project: TRA Warm Waste Pond Remediations
Project Number: #XAC13103

Sample Data

So. .e:
Sample No.: #3 State Pit BU-26
Elev. or Depth: Stockpile **Sample Length (in./cm.):**
Location: Sampled from state pit BU-26, near hwy 26.
Description: State chip pile. Poorly graded gravel
Liquid Limit: NV **Plastic Limit:** NP
USCS Classification: GP **AASHTO Classification:** A-1-a
Testing Remarks: Sampled from large chip stockpile in pit BU-26, located along hwy. 26, Butte Co. Estimated quantity of 700 cu.yds.

Mechanical Analysis Data

	Initial
Dry sample and tare=	999.50
Tare =	0.00
Dry sample weight =	999.50

Tare for cumulative weight retained= .00

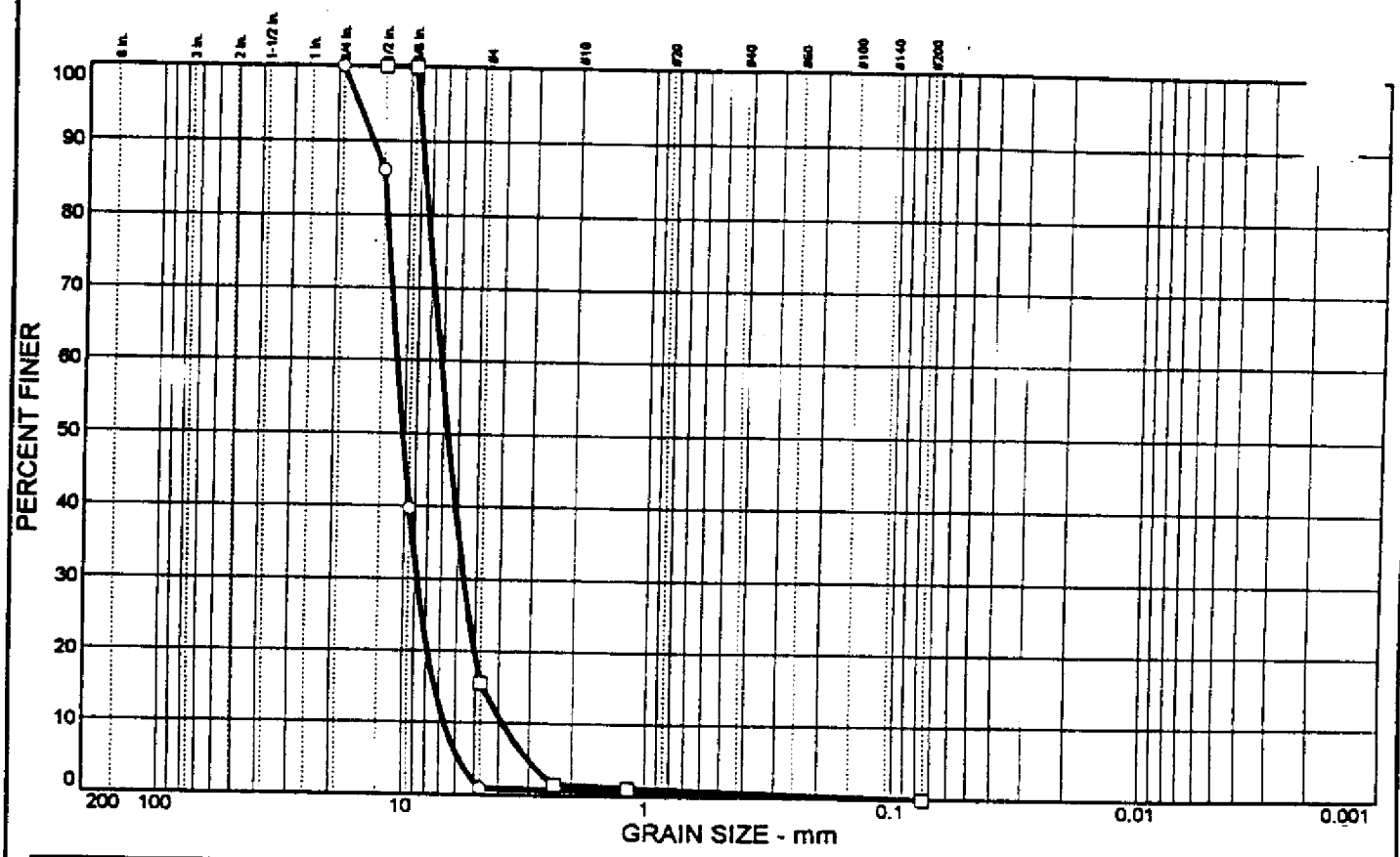
Sieve	Cumul. Wt. retained	Percent finer
1/2 inch	0.00	100.0
3/8 inch	12.90	98.7
4	936.30	6.3
8	981.30	1.8
200	999.50	0.0

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = 0.0 % GRAVEL = 93.7 (% coarse = 0.0 % fine = 93.7)
% SAND = 6.3 (% coarse = 4.6 % medium = 0.8 % fine = 0.9)

D_{85}= 8.76 D_{60}= 7.49 D_{50}= 7.01
D_{30}= 6.05 D_{15}= 5.28 D_{10}= 4.99
C_c= 0.9784 C_u= 1.5013

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL
○		99.0	1.0			GP	A-1-a	NP
□		84.5	15.5			GP	A-1-a	NP

SIEVE inches size	PERCENT FINER ○	□	
3/4	100.0		
1/2	86.1	100.0	
3/8	39.7	100.0	
	GRAIN SIZE		
D_{60}	10.9	7.20	
D_{30}	8.77	5.61	
D_{10}	6.67	3.87	
	COEFFICIENTS		
C_c	1.06	1.13	
C_u	1.64	1.86	

SIEVE number size	PERCENT FINER ○	□	
#4	1.0	15.5	
#8		1.6	
#16		1.2	
#200	0.0	0.0	

SOIL DESCRIPTION

○ "Chip" stockpile. Poorly graded gravel

□ Chip stockpile. Poorly graded gravel with sand

REMARKS:

○ Sampled from NRF/Lincoln road pit. This material was originally part of a "three bin" plant mix asphalt. This stockpile was "A" pile;

□ Sampled from small chip stockpile located at the INEEL Dairy Farm. This material is from Walters Concrete, Rexburg.

○ Location: NRF/Lincoln blvd. pit, aggregate stockpile.

□ Location: INEEL Dairy Farm Bio-Barrier plot.

INEL MATERIALS LAB

Client: Pat Taylor INEEL Environmental

Project: TRA Warm Waste Pond Remediations

Project No.: #XAC13103 Page

Client: Pat Taylor INEEL Environmental
Project: TRA Warm Waste Pond Remediations
Project Number: #XAC13103

Sample Data

Source:
Sample No.: #4 NRF Pit INEEL
Elev. or Depth: Stockpile Sample Length (in./cm.):
Location: NRF/Lincoln blvd. pit, aggregate stockpile.
Description: "Chip" stockpile. Poorly graded gravel
Liquid Limit: NV Plastic Limit: NP
USCS Classification: GP AASHTO Classification: A-1-a
Testing Remarks: Sampled from NRF/Lincoln road pit. This material was originally part of a "three bin" plant mix asphalt. This stockpile was "A" pile; coarse, crushed aggregate. Approx, 7,500 cu.yds.

Mechanical Analysis Data

	Initial
Dry sample and tare=	919.30
Tare =	0.00
Dry sample weight =	919.30

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3/4 inch	0.00	100.0
2 inch	127.60	86.1
3/8 inch	554.40	39.7
	910.00	1.0
#200	919.30	0.0

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = 0.0 % GRAVEL = 99.0 (% coarse = 0.0 % fine = 99.0)
% SAND = 1.0 (% coarse = 0.2 % medium = 0.4 % fine = 0.4)

D_{85}= 12.62 D_{60}= 10.92 D_{50}= 10.24
D_{30}= 8.77 D_{15}= 7.32 D_{10}= 6.67
C_c= 1.0572 C_u= 1.6359

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Sample Data

Source:
Sample No.: #5 Chip pile from INEEL "Dairy Farm"
Elev. or Depth: Stockpile Sample Length (in./cm.):
Location: INEEL Dairy Farm Bio-Barrier plot.
Description: Chip stockpile. Poorly graded gravel with sand
Liquid Limit: NV Plastic Limit: NP
USCS Classification: GP AASHTO Classification: A-1-a
Testing Remarks: Sampled from small chip stockpile located at the INEEL Dairy Farm. This material is from Walters Concrete, Rexburg.

Mechanical Analysis Data

	Initial
Dry sample and tare=	751.60
Tare =	0.00
Dry sample weight =	751.60

Tare for cumulative weight retained= .00

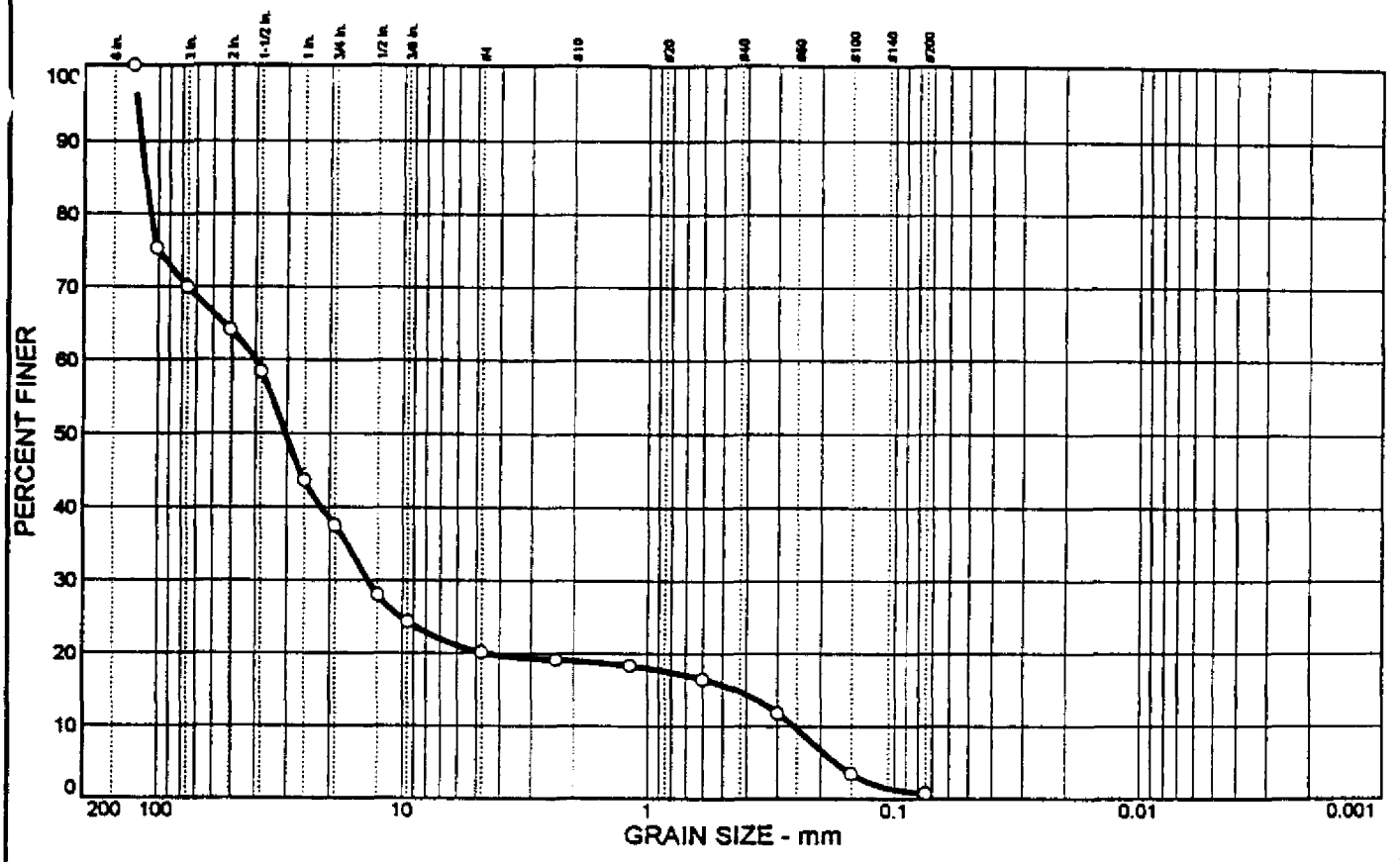
Sieve	Cumul. Wt. retained	Percent finer
1/2 inch	0.00	100.0
3/8 inch	0.00	100.0
# 4	635.50	15.5
# 8	739.70	1.6
# 16	742.80	1.2
# 200	751.60	0.0

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = 0.0 % GRAVEL = 84.5 (% coarse = 0.0 % fine = 84.5)
% SAND = 15.5 (% coarse = 14.0 % medium = 0.8 % fine = 0.7)

D_{85}= 8.60 D_{60}= 7.20 D_{50}= 6.67
D_{30}= 5.61 D_{15}= 4.67 D_{10}= 3.87
C_C= 1.1311 C_u= 1.8627

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
O		49.9	19.3			GP	A-1-a	NP	NV

SIEVE inches size	PERCENT FINER O		
5	100.0		
4	75.3		
3	70.0		
2	64.2		
1.5	58.4		
1	43.6		
3/4	37.5		
1/2	28.0		
3/8	24.3		
	GRAIN SIZE		
D_{60}	40.4		
D_{30}	14.0		
D_{10}	0.258		
	COEFFICIENTS		
C_c	18.71		
C_u	156.74		

SIEVE number size	PERCENT FINER O		
#4	20.1		
#8	19.1		
#16	18.3		
#30	16.5		
#50	11.8		
#100	3.5		
#200	0.8		

SOIL DESCRIPTION

O Pit run gravels. Poorly graded gravel with sand

REMARKS:

O Sampled from Phenix construction pit, Idaho Falls.

O Location: Pir located in Idaho Falls, Phenix Pit.

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Sample Data

Source:
Sample No.: #1 Pit run gravels
Elev. or Depth: Pit Sample Length (in./cm.):
Location: Pir located in Idaho Falls, Phenix Pit.
Description: Pit run gravels. Poorly graded gravel with sand
Liquid Limit: NV Plastic Limit: NP
USCS Classification: GP AASHTO Classification: A-1-a
Testing Remarks: Sampled from Phenix construction pit, Idaho Falls.

Mechanical Analysis Data

	Initial
Dry sample and tare=	10433.00
Tare =	0.00
Dry sample weight =	10433.00

Sample split on number 4 sieve
Split sample data:
Sample and tare = 519.30 Tare = .00 Sample weight = 519.30
Cumulative weight retained tare= .00
Tare for cumulative weig[illegible] retained= .00

Sieve	Cumul. Wt. retained	Percent finer
5 inch	0.00	100.0
4 inch	2575 [illegible]0	75.3
3 inch	3130[illegible].0	70.0
2 inch	3731.00	64.2
1.5 inch	4338.00	58.4
1 inch	5883.00	43.6
3/4 inch	6518.00	37.5
1/2 inch	7513.00	28.0
3/8 inch	7903.00	24.3
# 4	8338.00	20.1
# 8	25.40	19.1
# 16	45.80	18.3
# 30	92.60	16.5
# 50	215.80	11.8
# 100	428.10	3.5
# 200	498.30	0.8

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = 30.0 % GRAVEL = 49.9 (% coarse = 32.5 % fine = 17.4)
% SAND = 19.3 (% coarse = 1.1 % medium = 4.2 % fine = 14.0)
% FINES = 0.8

D_{85}= 112.74 D_{60}= 40.39 D_{50}= 30.38
D_{30}= 13.96 D_{15}= 0.44 D_{10}= 0.26
C_c= 18.7095 C_u= 156.7351

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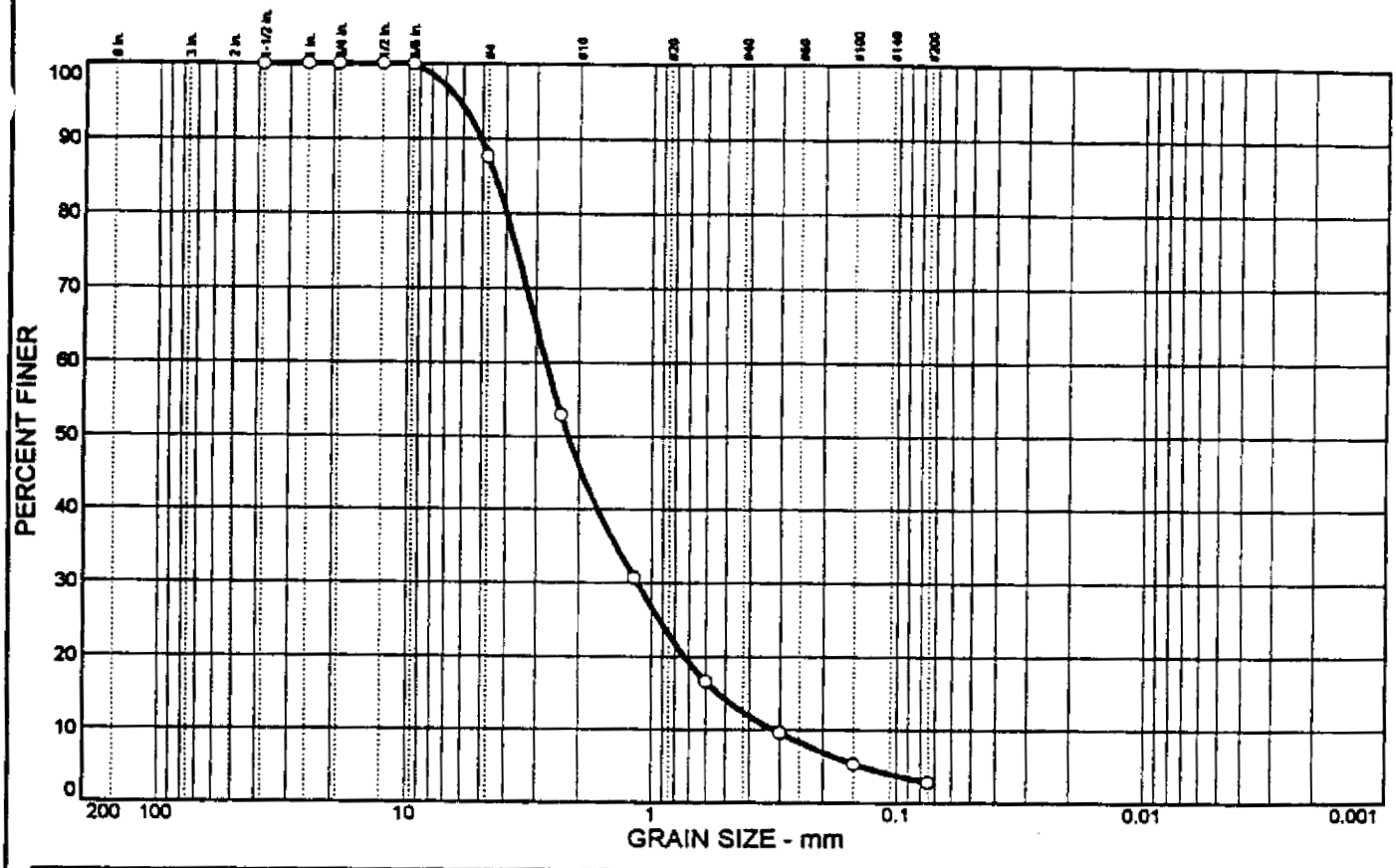
PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		12.3	84.8			SW	A-1-a	NP	NV

SIEVE inches size	PERCENT FINER ○		
1.5	100.0		
1.0"	100.0		
0.75"	100.0		
0.50"	100.0		
0.375	100.0		
	GRAIN SIZE		
D_{60}	2.72		
D_{30}	1.15		
D_{10}	0.317		
	COEFFICIENTS		
C_c	1.53		
C_u	8.59		

SIEVE number size	PERCENT FINER ○		
#4	87.7		
#8	52.9		
#16	30.6		
#30	16.6		
#50	9.6		
#100	5.4		
#200	2.9		

SOIL DESCRIPTION

○ Reject sand. Well-graded sand

REMARKS:

○ Sampled from large stockpile in pit BU-26, along hwy. 26, Butte Co. Estimated quantity, 7500 cu.yds.

○ Location: Sampled from large stockpile in pit BU-26.

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GRAIN SIZE DISTRIBUTION TEST DATA

Client: Pat Taylor INEEL Environmental
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Sample Data

Source: Misc. other gradations
Sample No.: #1 State Pit BU-26
Elev. or Depth: Stockpile Sample Length (in./cm.):
Location: Sampled from large stockpile in pit BU-26.
Description: Reject sand. Well-graded sand
Liquid Limit: NV Plastic Limit: NP
USCS Classification: SW AASHTO Classification: A-1-a
Testing Remarks: Sampled from large stockpile in pit BU-26, along hwy. 26, Butte Co. Estimated quantity, 7500 cu.yds.

Mechanical Analysis Data

	Initial
Dry sample and tare=	662.90
Tare =	0.00
Dry sample weight =	662.90

Tare for cumulative weight retained= .00

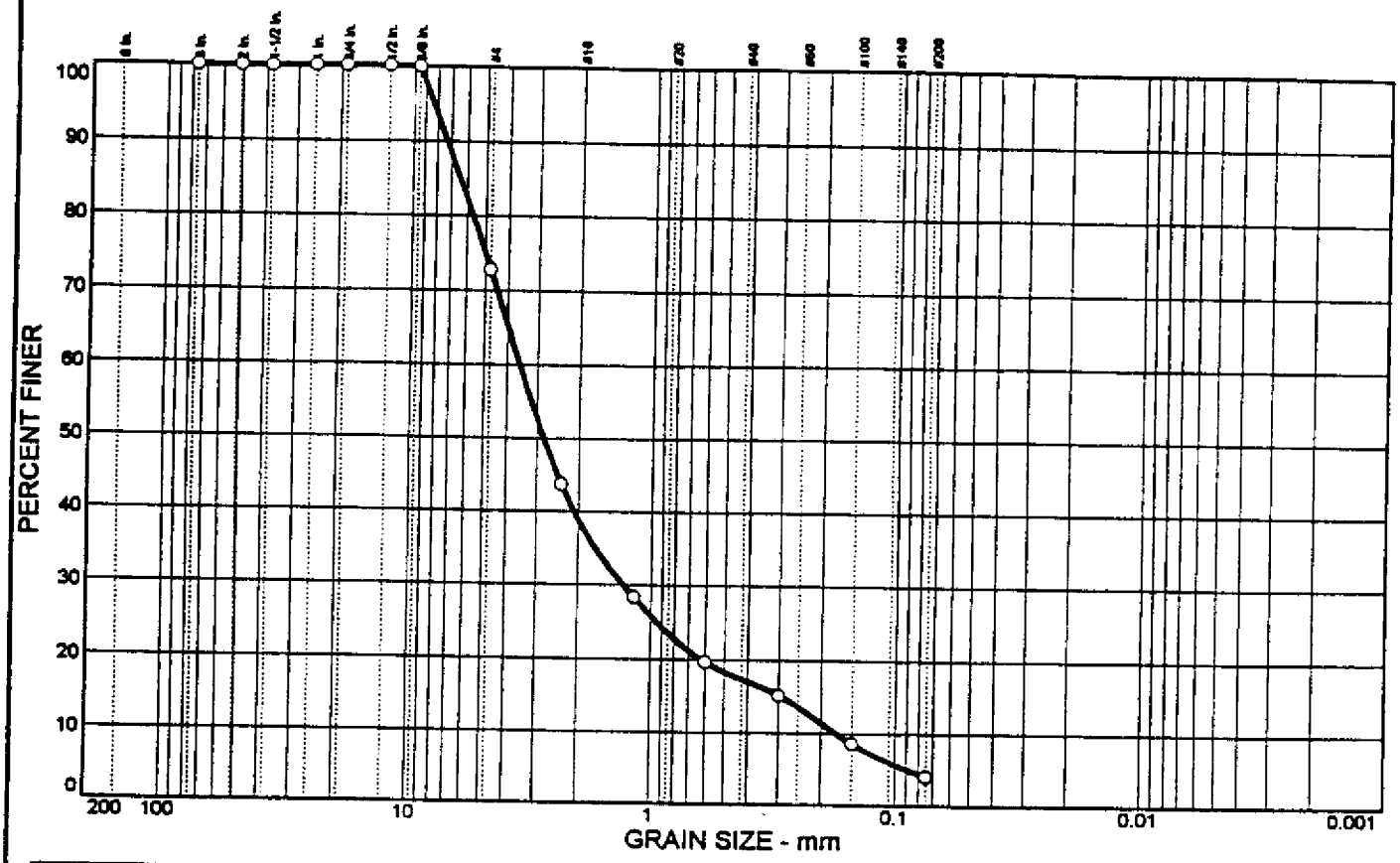
Sieve	Cumul. Wt. retained	Percent finer
1.5 inch	0.00	100.0
1.0 inch	0.00	100.0
0.75 inch	0.00	100.0
0.50 inch	0.00	100.0
0.375 inch	0.00	100.0
# 4	81.30	87.7
# 8	312.10	52.9
# 16	460.20	30.6
# 30	552.70	16.6
# 50	599.50	9.6
# 100	627.40	5.4
# 200	643.50	2.9

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = 0.0 % GRAVEL = 12.3 (% coarse = 0.0 % fine = 12.3)
% SAND = 84.8 (% coarse = 41.7 % medium = 33.6 % fine = 9.5)
% FINES = 2.9

D_{85}= 4.44 D_{60}= 2.72 D_{50}= 2.21
D_{30}= 1.15 D_{15}= 0.54 D_{10}= 0.32
C_c= 1.5339 C_u= 8.589

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		27.2	68.7			SW	A-1-a	NP	NV

SIEVE inches size	PERCENT FINER ○		
3"	100.0		
2"	100.0		
1.5"	100.0		
1.0"	100.0		
0.75"	100.0		
0.50"	100.0		
0.375"	100.0		
	GRAIN SIZE		
D_{60}	3.55		
D_{30}	1.31		
D_{10}	0.174		
	COEFFICIENTS		
C_c	2.78		
C_u	20.40		

SIEVE number size	PERCENT FINER ○		
#4	72.8		
#8	43.7		
#16	28.3		
#30	19.7		
#50	15.2		
#100	8.6		
#200	4.1		

SOIL DESCRIPTION

○ Reject Sand. Well-graded sand with gravel

REMARKS:

○ Sampled from small stockpile located in the bottom of the old pit. Estimated quantity is 100 cu.yds.

○ Location: Sampled from BN-33-S pit, stockpile in bottom.

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GRAIN SIZE DISTRIBUTION TEST DATA

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Sample Data

Source: Misc. other gradations
Sample No.: #2 State Pit BN-33-S
Elev. or Depth: Stockpile Sample Length (in./cm.):
Location: Sampled from BN-33-S pit, stockpile in bottom.
Description: Reject Sand. Well-graded sand with gravel
Liquid Limit: NV Plastic Limit: NP
USCS Classification: SW AASHTO Classification: A-1-a
Testing Remarks: Sampled from small stockpile located in the bottom of the old pit. Estimated quantity is 100 cu.yds.

Mechanical Analysis Data

	Initial
Dry sample and tare=	552.20
Tare =	0.00
Dry sample weight =	552.20

Tare for cumulative weight retained= .00

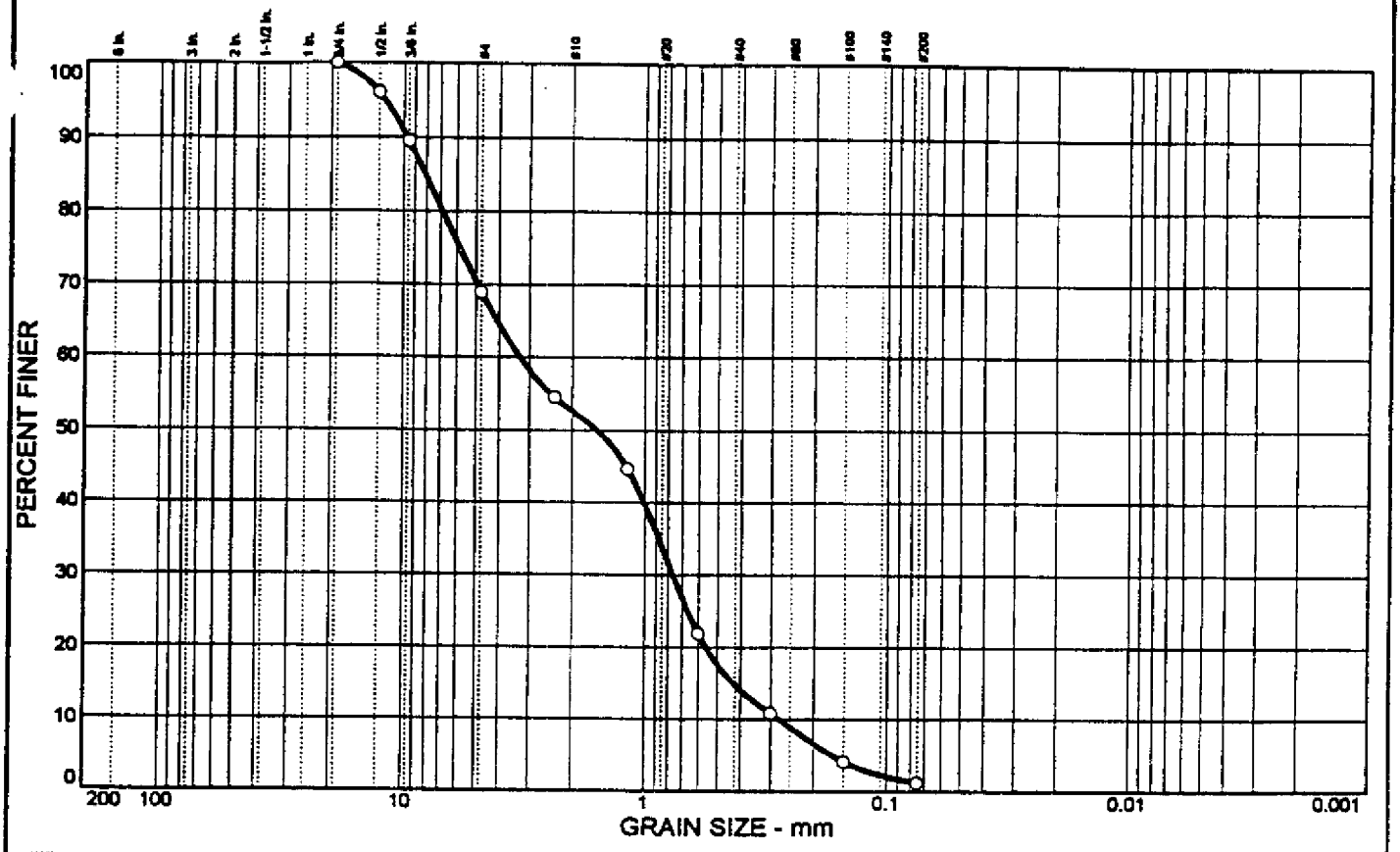
Sieve	Cumul. Wt. retained	Percent finer
3 inch	0.00	100.0
2 inch	0.00	100.0
1.5 inch	0.00	100.0
1.0 inch	0.00	100.0
0.75 inch	0.00	100.0
0.50 inch	0.00	100.0
0.375 inch	0.00	100.0
# 4	150.20	72.8
# 8	310.80	43.7
# 16	396.00	28.3
# 30	443.60	19.7
# 50	468.50	15.2
# 100	504.50	8.6
# 200	529.60	4.1

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = 0.0 % GRAVEL = 27.2 (% coarse = 0.0 % fine = 27.2)
% SAND = 68.7 (% coarse = 34.0 % medium = 21.4 % fine = 13.3)
% FINES = 4.1

D_{85}= 6.41 D_{60}= 3.55 D_{50}= 2.80
D_{30}= 1.31 D_{15}= 0.29 D_{10}= 0.17
C_c= 2.7761 C_u= 20.3988

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		31.0	67.7			SP	A-1-b	NP	NV

SIEVE inches size	PERCENT FINER ○		
3/4	100.0		
1/2	96.0		
3/8	89.5		
GRAIN SIZE			
D_{60}	3.28		
D_{30}	0.766		
D_{10}	0.278		
COEFFICIENTS			
C_c	0.64		
C_u	11.79		

SIEVE number size	PERCENT FINER ○		
#4	69.0		
#8	54.5		
#16	44.6		
#30	21.9		
#50	10.8		
#100	4.2		
#200	1.3		

SOIL DESCRIPTION

○ 3/4 Crushed. Poorly graded sand with gravel

REMARKS:

○ Sampled from medium sized stockpile located in the state pit. Estimated quantity, 1,000 cu.yds.

○ Location: Pit located along New Sweden rd., Idaho Falls.

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GRAIN SIZE DISTRIBUTION TEST DATA

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Sample Data

Source: Misc. other gradations
Sample No.: #3 State Pit BN-127-S
Elev. or Depth: Stockpile **Sample Length (in./cm.):**
Location: Pit located along New Sweden rd., Idaho Falls.
Description: 3/4 Crushed. Poorly graded sand with gravel
Liquid Limit: NV **Plastic Limit:** NP
USCS Classification: SP **AASHTO Classification:** A-1-b
Testing Remarks: Sampled from medium sized stockpile located in the state pit. Estimated quantity, 1,000 cu.yds.

Mechanical Analysis Data

	Initial
Dry sample and tare=	804.10
Tare =	0.00
Dry sample weight =	804.10

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
3/4 inch	0.00	100.0
1/2 inch	32.20	96.0
3/8 inch	84.20	89.5
# 4	249.70	69.0
# 8	365.90	54.5
# 16	445.70	44.6
# 30	628.10	21.9
# 50	717.10	10.8
# 100	770.70	4.2
# 200	793.80	1.3

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = 0.0 % GRAVEL = 31.0 (% coarse = 0.0 % fine = 31.0)
% SAND = 67.7 (% coarse = 16.4 % medium = 37.8 % fine = 13.5)
% FINES = 1.3

D_{85}= 8.12 D_{60}= 3.28 D_{50}= 1.58
D_{30}= 0.77 D_{15}= 0.43 D_{10}= 0.28
C_c= 0.6443 C_u= 11.7905